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TREATMENT OF RESPIRATORY FAILURE IN ACUTE EPIDEMIC POLIOMYELITIS

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The barospirator for artificial respiration designed by Thunberg[1] served as a basis for the construction of the respirators now used in many hospitals for the treatment of respiratory failure in poliomyelitis. In the Thunberg barospirator the patient was entirely enclosed in an air-tight cylinder. The air pressure within this cylinder was alternately raised and lowered, resulting in an intrapulmonary exchange of air sufficient to maintain life for long periods. Thunberg aptly described the effect of the barospirator on the patient as resulting in respiration without respiratory movement. It soon became evident that this ingenious apparatus was not satisfactory for cases of prolonged respiratory failure. Drinker and Shaw[2] modified the barospirator so that the patient's head would be outside the air-tight cylinder. This is the apparatus most frequently used for respiratory failure in poliomyelitis.

Forty-six patients with respiratory embarrassment due to poliomyelitis were treated in the Drinker respirator at the Willard Parker Hospital in 1931. There were many others with involvement of the respiratory mechanism who survived without artificial respiration. Some patients with urgent cases were transferred to other hospitals where respirators were available, because at times all of our respirators were in use. After the first few weeks patients with bulbar lesions were not considered suitable for treatment by this method, and preference was given those with only spinal involvement.

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1. Thunberg, T.: Atmung ohne Atembewegung, Klin. Wchnschr. **4**:536 (March 19) 1925. Enghoff, H.: Der Barospirator, Skandinav. Arch. f. Physiol. **52**:1, 1927.

2. Drinker, P., and Shaw, L. A.: An Apparatus for Prolonged Administration of Artificial Respiration, J. Clin. Investigation **7**:229 (June 20) 1929.

Whether every patient who has respiratory embarrassment should be placed in the respirator is not settled. Some observers [3] think that artificial respiration is indicated in order to rest the injured nerve cells. The nerve cells associated with skeletal muscles are probably protected from stimuli when the muscles are immobilized. At present it is not known whether artificial respiration prevents stimulation of the nerve cells associated with respiration. A further analogy to skeletal muscles does not necessarily apply to the respiratory muscles. The impression is that spontaneous breathing will stretch the weakened respiratory muscles, just as the skeletal muscles of an extremity are stretched by incorrect immobilization or active motion. There are no antagonistic muscles to the diaphragm or intercostal muscles, and therefore stretching of the paralyzed muscles will not occur. Another point to be borne in mind is that pulmonary complications may occur in patients treated in the respirator. During the last five years we have observed many patients with poliomyelitis with respiratory embarrassment who were not treated with artificial respiration. As far as we know, none of them presented pulmonary complications similar to those described later in this paper. Until more is known about the causative mechanism of these conditions, we feel that only patients with definite indications should be treated in the respirator.

TECHNIC

Use of the Respirator.—The adult size respirator has only three rates of artificial respiration, namely 15, 30 and 45 revolutions a minute.[4] For the majority of our patients we used a rate of 30 a minute. Some patients when first put in the respirator did not synchronize with the rhythm of the machine. We used only negative pressure, so that inspiration was induced. Expiration was spontaneous and a result of the normal elasticity of the lungs. The negative pressure used in most of our cases was between 15 and 20 cm. of water. This is the pressure suggested by Drinker.[5] The normal intrapulmonary pressure in man as measured by Aron [6] averaged 18 cm. of water. A similar negative pressure applied outside the thoracic wall would surely be within the limits of safety. If a patient relaxed and cooperated, a pressure of more than 20 cm. of water was not needed to obtain the desired effect. Increasing the negative pressure too much may be harmful. It probably accounts, to some extent, for the presence of emphysema in most of the lungs examined post mortem (tables 5 and 6). In spite of constant reassurance,

3. Wilson, J. L.: Respiratory Failure in Poliomyelitis: Treatment with the Drinker Respirator, Am. J. Dis. Child. **43**:1433 (June) 1932.

4. The respirators which we used were constructed according to the model described in the report of the Council on Physical Therapy of the American Medical Association (J. A. M. A. **96**:1580 [May 9] 1931).

5. Drinker, P.; Shaughnessy, T. J., and Murphy, D. P.: The Drinker Respirator, J. A. M. A. **95**:1249 (Oct. 25) 1930.

6. Aron, quoted by Emerson: Johns Hopkins Hosp. Rep. **11**:194, 1903.

some children, as well as adults, resisted the action of the respirator. Therefore large doses of sedatives and even morphine should be given before artificial respiration is started.

Recently Favill and Fentress [7] suggested the use of positive pressure during the expiratory phase. They found it helpful in controlling the oral mucus and pulmonary congestion which often are troublesome occurrences. The respirator as originally designed made use of both a positive and a negative pressure within the steel chamber. We used only a negative pressure. Further observations will be made to determine whether a slight positive pressure during expiration is beneficial.

General Care.—It is important to treat the patient as well as the respiratory paralysis. It was frequently necessary to give repeated large doses of sedatives after the patient was in the respirator. The patient must be cooperative enough or drowsy enough to permit the respirator to breathe for him. Resisting the artificial respiration may be harmful. To avoid pulmonary stasis and atelectasis as much as possible, we turned each patient on his side or abdomen several times a day. In spite of this there was roentgenographic or postmortem evidence of atelectasis and exudate in the alveoli in many cases (tables 4, 5 and 6).

Hypodermic medication was given, and the pulse and temperature were taken through the openings in the side of the machine. Hypodermoclyses and venoclyses were utilized while the respirator was in action by substituting corks with glass tubing passed through them for the solid rubber corks in the top of the respirator. Rubber tubing was attached to each end of the glass tubing, and the treatment was then a simple matter.

Constipation was frequently a troublesome occurrence. A contributing factor was the inability of the patient to produce a positive intra-abdominal pressure. Even after discharge, before the respiratory function had completely returned, several children required frequent catharsis. A mild laxative was given every night in order to avoid the necessity of enemas, which interfere with the artificial respiration.

Orthopedic treatment must not be overlooked. Lack of space in the respirator precluded the application of splints to the upper extremities during artificial respiration. However, the lower extremities and trunk were given the proper support while the patient was in the respirator.

Many of our patients found the rubber collar uncomfortable. Its to and fro movement irritated the neck. It was helpful to leave a little space between the skin and the rim of the hole in the collar. This not only prevented irritation but permitted a little draught of air to pass over the neck and chest, which was grateful to the patient. We had two patients with severe irritation as a result of trauma from the collar. One was sent to us from another hospital after the child had been in the respirator for six days. He was considered well enough to be returned to bed, but became worse after a few days. At that time no respirator was available, and he was transferred to Willard Parker Hospital. He had an open wound encircling the neck, and we therefore decided not to place him in the respirator unless it was absolutely necessary. He was watched carefully and discharged after three weeks with greatly improved respiratory function.

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7. Favill, J., and Fentress, T. L.: A Case of Respiratory Failure in Poliomyelitis Successfully Treated in a Respirator, J. A. M. A. **97**:1464 (Nov. 14) 1931.

We had difficulty in keeping the temperature within the respirator low enough for comfort. The temperature at times rose to 100 F. Placing wet sheets on the steel chamber or ice inside was not satisfactory. Either the air passing into the respirator must be cooled or some cooling apparatus must be placed inside the respirator.

Removal from the Respirator.—The return of the respiratory function could be gaged at first by the reaction of the patient during nursing care outside the respirator. When it was possible to complete some of the longer nursing procedures outside the respirator without discomfort to the patient, the "out period" was gradually increased until the patient could do without the respirator for an entire day. Usually he was replaced for the night a few times. Some of the children became apprehensive and restless when the respirator was stopped, even though they were comfortable for long periods without artificial respiration while lying quietly. The additional respiratory demand due to restlessness and talking would result in dyspnea and cyanosis. To overcome this, the pressure was gradually decreased to such an extent that the artificial respiration ceased, but the motor continued to run. These patients were perfectly comfortable while breathing of their own accord in the respirator, but objected to having the respirator opened or the motor stopped. Continued reassurance helped the children to regain their self confidence, and after a few days they were willing to stay on the respirator carriage with the motor stopped.

When the demand for respirators permitted, children were returned to bed only after they had breathed spontaneously for twenty-four hours or more at a stretch, during which time they were comfortable and their color remained good. They were kept in a bed near the respirator for two or more weeks, so that if the necessity arose they could have artificial respiration immediately.

In some hospitals,[8] patients are placed in the respirator for several hours each day after their respiratory function has returned sufficiently to enable them to breathe spontaneously. Toward the end of the epidemic we tried this with a few patients, but were unable to observe them long enough to note any benefit.

ANALYSIS OF CASES

Age and Sex.—The youngest patient treated in the respirator was 14 months of age, and the oldest was 24 years. The youngest patient to survive was 3 years. There were eighteen females and twenty-six males. The age and sex of the patients according to the clinical type are shown in table 1.

Types of Patients Treated.—The patients were divided into two groups. Those with paralysis of the diaphragm, of the intercostal muscles or of both were classified as having spinal lesions. The cases of spinal lesions were subdivided (table 2) into fatal and nonfatal cases. The patients who had involvement of the cranial nerves, and in whom the respiratory center was presumably affected, were classified as having bulbar lesions (table 2). All of the twelve patients with bulbar lesions died. Four of them died within twenty hours and five within three hours after being placed in the respirator. Sixteen of

the thirty-four patients with spinal lesions died in the respirator, eight in less than twenty hours and one in less than three hours. Eighteen patients left the hospital alive. Four of these died at other hospitals from pulmonary complications, from fourteen to forty-five days after discharge from Willard Parker Hospital.

TABLE 1.—*Age and Sex of Patients Treated in the Respirator According to Type of Lesion and Result*

Patients with Spinal Lesions Who Survived		Patients with Spinal Lesions Who Died		Patients with Bulbar Lesions Who Died	
Age in Years	Sex	Age in Years	Sex	Age in Years	Sex
3	M	1 2/12	M	3½	F
3	F	1½	M	4	M
4	M	1½	M	4½	F
5	F	2½	M	6	M
5	F	3	F	7½	F
5	M	4	M	10	F
6	F	4½	M	11	M
8	M	6	M	15	F
8	M	7	F	16	M
9½	M	8	M	22	M
10	M	9	M	23	M
10	M	15	F	24	F
11	M	18	F		
12	M	19	F		
13	F	21	M		
14	F	21	F		
14	M				
15	M				

TABLE 2.—*Time Factors for the Forty-Six Patients Treated in the Respirator*

	Days Ill			Days of Respiratory Weakness			Days in Respirator			Spinal Fluid Cell Count		
	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average
Patients with spinal lesions who survived	16	3	6.6	8	0*	1.5	29	1	13	450	20 (9 cases)	150
†	8	3	5.7	3	0	1.1						
Patients with spinal lesions who died	9	3	5.2	3.5	0	0.7	5	0.15	1.1	540	30 (11 cases)	218
‡	..	..	...	1	0	0.5	2	0.15	0.8			
Patients with bulbar lesions	9	3	6	2	0	0.44	2	0.04	0.5	130	50 (9 cases)	223

* Under days of respiratory weakness, 0 indicates that there was no history of respiratory weakness and that the patient was placed in the respirator immediately after admission to the hospital, or as soon as the respiratory weakness was observed in the ward.
† Figures in this line exclude case 8.
‡ Figures in this line exclude case 32.

Time Factors.—In order to determine whether the duration of the illness or the duration of the respiratory weakness before the patient was placed in the respirator was of any significance in the ultimate result, the cases were analyzed individually, and the data are summarized in table 2. The duration of the illness before they were placed

in the respirator was practically the same in all three groups of patients. However, the duration of the respiratory weakness before the patient was placed in the respirator showed significant differences in the three groups. It was frequently difficult to obtain an accurate history, and in some instances the respiratory embarrassment probably was present longer than we were able to determine. The average duration of difficulty in breathing among the patients who survived was twenty-six hours (excluding case 8). The patients with spinal lesions who died had respiratory difficulty for an average of sixteen hours before they were placed in the respirator. The patients with bulbar lesions had a much more rapidly progressing condition. Two had difficulty in breathing for two days. The same two patients survived longer in the respirator (twenty-four and forty-eight hours) than the others with bulbar lesions. The remaining ten patients with bulbar lesions had an average duration of respiratory weakness of only three hours.

Respiratory involvement in patients with bulbar lesions progressed more rapidly than in patients with spinal lesions. The chances of severe mechanical or toxic injury to the small respiratory center in the midbrain are much greater than the chances of injury to the majority of nerve cells in the thoracic and cervical levels of the cord which control the muscles of respiration. However, if death were due only to respiratory paralysis, the patients should have survived longer in the respirator (the average was twelve hours). Some seemed to succumb to toxemia, and not infrequently generalized edema and congestion of the brain were found at autopsy. Others apparently had vasomotor disturbances with subsequent cardiovascular failure.

Only one of the patients who died in the respirator received artificial respiration for more than two days. This child (case 32) was treated for five days, apparently with a satisfactory result. She was in bed in good condition for one and a half days. However, during this time she had an anxious expression and her temperature remained between 101 and 102 F. This should have been taken as an indication that the disease was still active. Shortly after drinking a glass of water the patient became dyspneic and cyanotic. She was immediately placed in a respirator but failed to rally and died twelve hours later. From our experience it seems that a patient who survives the first two days in the respirator has a good chance to recover respiratory function.

Aspiration.—Aspiration of mucus, saliva and vomitus was a serious problem, especially in patients with bulbar lesions. It was difficult to determine how much it contributed to the fatal outcome. Continued suction was not feasible or always successful in preventing aspiration.

An artificial respirator, described by one of us,[8] is constructed for intratracheal insufflation and thus precludes the possibility of aspiration. Such an apparatus may be more successful in the bulbar cases and will be tried in the future.

Temperature.—The best indication of the progress of the disease was the temperature. The pulse rate, examination of the spinal fluid and blood counts gave us no information on this point. A persistent elevation of temperature almost always indicated an unfavorable prognosis. All except six of the patients that survived had temperatures under 101 F. after the third day. One of the six had a serum reaction, another an active reaction to vaccination and a third pyuria. Two had unexplained elevations of temperature until the fourth and fifth days, respectively. One patient had frequent elevations of temperature and showed evidence of extension of the disease.

TABLE 3.—*Average Pulse Rates by Age Groups of Patients While in the Respirator and for Several Weeks After Removal from the Respirator*

	Age in Years		
	3–6	7–10	11–15
Normal range *	86 to 105	80 to 90	75 to 94
Rate in respirator	124	116	108
Rate outside respirator	120	112	102

* The normal range was taken as the average reported by two observers (Diven, John, in Abt, I. A.: Pediatrics, Philadelphia, W. B. Saunders Company, 1923, vol. 2, p. 214. Young, Josephine: Ibid., vol. 1, p. 946).

Pulse.—Although the patients were afebrile, comfortable and lying quietly in bed, the pulse rate was increased. The pulse rate of the patients who survived is shown according to three age groups in table 3. The pulse rate in well children varies considerably. However, all the patients had a pulse rate higher than the upper limit of the normal range for their age group. This suggested that the circulation was slightly embarrassed. Several roentgenograms taken toward the end of the period of artificial respiration showed accentuation of the pulmonary markings owing to vascular engorgement. During the inspiratory phase in the respirator a negative intra-abdominal pressure is substituted for the normal positive pressure. When the patient is out of the respirator the negative intrathoracic pressure is less than normal owing to residual weakness of the respiratory muscles. Significant changes in the intra-abdominal or the intrathoracic pressure interfere with the filling of the venae cavae and the emptying of the blood into the right auricle. Such an impairment of the circulation increases the heart rate.

8. Brahdy, L., and Brahdy, M. B.: An Intratracheal Method for Prolonged Artificial Respiration, Am. J. M. Sc. **178**:405 (Sept.) 1929.

Spinal Fluid.—Some of the patients were too ill to permit lumbar puncture for diagnostic purposes, and we did not use repeated spinal drainage in the treatment unless there was definite evidence of increased intracranial pressure. The results of several of the examinations of the spinal fluid were reported to us by physicians who saw the patients before their admission to the hospital. The cell counts in the spinal fluids in the three groups were not significantly different (table 2). The general tendency was for the cell counts to be a little lower in the patients with spinal lesions who survived. Only twice was the count in this group over 150. In the fatal cases of spinal lesions eight counts were over 150, and three were under 60. The general tendency was for the cell count to be higher in the bulbar than in the spinal cases. Two counts were under, and seven over, 1140. The differential cell count and the amount of globulin present were about the same in each group.

Serum.—Only patients in the preparalytic stage received serum in the hospital. One received 3 cc. of antipoliomyelitic horse serum globulin by vein. A slight respiratory weakness developed, and he was placed in the respirator for two days. Two other children received convalescent serum in the preparalytic stage. Both recovered after ten and twenty-three days in the respirator. Three patients with fatal bulbar lesions were given serum in the preparalytic stage before admission to the hospital. One patient with spinal lesions who died received convalescent serum intravenously on the second day of illness; the history does not state definitely whether or not paralysis was present at the time. The only conclusion that one can draw from these few cases is that in patients treated with serum, in either the preparalytic or the paralytic stage, respiratory paralysis may develop.

Pulmonary Complications.—Four children died in acute respiratory distress forty-five, twenty-four, twenty-four and nineteen days, respectively, after removal from the respirator. Three of them had an uneventful convalescence from the time of discharge from the Willard Parker Hospital to the onset of their acute pulmonary symptoms. Unfortunately, they were admitted to other hospitals, and therefore were not observed by us. The data given for the following cases were obtained from the notes on the charts.

REPORT OF CASES

CASE 16.—E. I. died forty-five days after removal from the respirator. The child was doing nicely at an orthopedic hospital for a month after discharge from the Willard Parker Hospital. Then respiratory distress suddenly developed, and she was transferred to Bellevue Hospital. The note on admission stated that her breathing was chiefly diaphragmatic, but there was no cyanosis. She coughed.

Dulness, diminished fremitus, decreased breath sounds and coarse moist râles were found over both lungs. The temperature was 100 F., and the pulse rate 138 (weak). The patient asked to be placed in the respirator. The diagnosis was poliomyelitis and bronchitis. The child's condition was good while she was in the respirator, but she coughed and became cyanotic as soon as artificial respiration was stopped. Later in the day the diagnosis was changed to bronchial pneumonia. The following day the temperature rose to 104 F., and the patient was restless, anxious and cyanotic. The temperature remained high; the child fought the action of the respirator, and steadily became worse. She died four days after admission. There was no autopsy.

Case 17.—William C. died twenty-four days after removal from the respirator. At the Willard Parker Hospital, he responded nicely for twelve days after removal from the apparatus. Then he was transferred to an orthopedic hospital, where his condition remained satisfactory for nine days. Except for one day, his temperature was under 100 F. On the tenth day he became ill, râles were heard, and a diagnosis of pneumonia was made. The next day the following note was made on the chart: "Child desperately ill; labored breathing, almost edematous in type. Slight expansion of the chest on the right side due to intercostal paralysis. On the right side, increased fremitus and bronchovesicular breathing over the upper portion and no fremitus and almost no breathing over the base of the lung. Impression: bronchial pneumonia with probable fluid at base." No fluid was obtained by thoracentesis. A roentgenogram revealed a dense shadow involving the entire right side. The report by Dr. Lewis stated that there was a massive collapse of the right lung; the lung was completely without air content, and the mediastinum was displaced far toward the affected side. The left lung was clear. The temperature rose to 104 F., and the child died. There was no autopsy.

Case 15.—J. R. was in a respirator at the Willard Parker Hospital for three days, and at the end of that time did fairly well without artificial respiration for several hours. An irritation of the skin of the neck with slight swelling developed because the rubber collar had been too tight. His breathing seemed adequate enough to permit removal from the respirator. He did well for twenty-four hours, but then began to show signs of respiratory distresss. He was immediately transferred to the Kingston Avenue Hospital, where a respirator was available. He was in a respirator for four days and did fairly well out of the machine for the following three days. Then he suddenly became acutely ill, perspired and was dyspneic and cyanotic. His temperature was 103.2 F. The breath sounds in the left axilla were suppressed. Two days later he was much improved, and from that day his temperature remained under 100 F. After four days of normal temperature he was taken home by his parents, against the advice of the attending physicians. He was readmitted three days later as presenting an emergency case. He was cyanotic, and his breathing was rapid and shallow. After a few hours he improved and did fairly well for two days. Then he had another bad turn. The report on the chart was as follows: "Anxious expression; irregular pulse; cyanosis; dyspnea; stimulation without effect." Artificial respiration in a respirator had no effect. The temperature was 99 F. The child died soon after the onset of the acute symptoms. There was no autopsy.

Case 18.—J. S. died twenty-four days after removal from the respirator. In spite of a rapidly ascending paralysis, the child regained a great deal of her respiratory function after prolonged treatment. When she had been out of the respirator for thirteen days, she was transferred to another hospital. There her

condition continued to be satisfactory, and she was sent home ten days later. A few hours after arriving home, she had some convulsive movements. Twelve hours later, she was admitted to another hospital in coma. She was gasping for air and cyanotic, and her temperature was 103 F. There was greater excursion of the left side of the chest than of the right. She was placed in a respirator, but did not improve. She died ten hours after admission. The autopsy report was as follows: "Congested vessels on the surface of the brain; no pus; dura, clean; no epidural or subdural hemorrhages. Lungs show no adhesions; no free fluid; lungs voluminously large, normal in appearance, with moderate congestion at the bases. Heart, liver and kidneys normal."

Each of the four patients had one or more attacks of respiratory distress. One child recovered from two attacks but succumbed to the third, during which time her temperature was normal. The mode of onset, the symptoms and the physical signs were not characteristic of pneumonia. The roentgenogram taken in one case showed a massive atelectasis. The one autopsy failed to reveal pneumonic infiltration. Our impression is that the condition in at least three of the cases was atelectasis of the lung. It is conceivable that mucus which is easily expelled by a normal child could obstruct a bronchus in a child whose expiratory force is diminished as a result of paralysis. Possibly there is some mechanism entirely unrelated to obstruction which causes the lungs to collapse. In postoperative massive atelectasis recovery is the rule. The patient is able to compensate for the functional withdrawal of a large part of his lung tissue. The four children in our cases, however, were unable to cope with the additional burden of a reduced pulmonary field, and succumbed in acute respiratory distress.

Pulmonary complications also occurred in several children who survived. In one boy (case 4) atelectasis developed in the upper lobe of the right lung while he was in the respirator. The roentgenographic shadow persisted for ten days. Another boy (case 8) who was in a respirator for only twenty hours had an interesting episode. He had been observed at the Willard Parker Hospital for several days, and it was thought that he could recover without artificial respiration. One night an intern thought there was some cyanosis and placed the patient in a respirator. The following day he was removed from the respirator, and remained in good condition until his discharge to an orthopedic hospital, sixteen days after admission. At the orthopedic hospital he did well for two weeks. Then severe respiratory distress suddenly developed, and he was transferred to the Fordham Hospital for treatment in the respirator. A diagnosis of pulmonary atelectasis was made clinically and confirmed by roentgenograms. He was placed in a respirator for twenty-four hours, but there was no change in his condition. He gradually improved and was well when seen four months later.

We do not feel justified in stating that massive atelectasis occurs only in patients treated in the respirator. One of us has been interested in the respiratory paralysis in poliomyelitis for several years, and no such complication was observed in the past. This may be due to a more thorough follow-up system this year, or perhaps children who in former years would have died of respiratory failure survived as a result of treatment in the respirator and were particularly susceptible to such complications as atelectasis.

PATHOLOGY

The pathologic material was examined by Dr. Lawrence Smith. Only the pertinent points found in the lungs and central nervous system are recorded in tables 4, 5 and 6. In addition there was usually a lymphoid hyperplasia and frequently focal necrosis in parenchymatous organs. We shall not attempt to discuss these and other interesting observations, especially since Dr. Smith expects to report the work in detail in the near future. The changes in the central nervous system were studied in fifteen cases. In tables 5 and 6 we record the changes under the inclusive term "acute reaction." This was used for the sake of brevity when there were present edema, congestion, hemorrhage, perivascular cuffing, nerve cell degeneration and necrosis. The clinical neurologic data could be fairly well correlated with the pathologic picture. In two instances (cases 38 and 45) the pathologic changes were more extensive than was expected from the clinical observations, but the patients could not be examined for additional paralysis when they were in the respirator.

Permission was obtained for postmortem examination of the lungs of twelve patients who died in the hospital following treatment in the respirator. An alveolar exudate of serum and blood cells was found in ten of the twelve lungs. The exudate in four was sufficient to be considered pneumonic. Two of these patients (cases 41 and 46) had lesions which probably had their inception before treatment in the respirator was begun. Vascular engorgement and congestion were frequently present. Emphysema and atelectasis were found in all cases. A few patients not treated in the respirator showed atelectasis and emphysema but not to the same extent. In one instance (case 46) the lungs were partially collapsed when the chest was opened. There was a loss of the normal elasticity, although the patient had been in the respirator only forty-six hours. Wilson [3] examined the lungs of three children who had been treated in the respirator. He also found congestion of all the blood vessels, transudation of serum and red blood corpuscles into the alveolar spaces and emphysema. He attributed a

TABLE 4.—*Patients with*

Case No., Hosp. No., Age, Days Ill When Admitted	History	Examination on Admission and Course Before Artificial Respiration	Day	Course in Respirator
1 5392 10 yrs. 5 days	Fever, malaise, stiff neck, stiff and tender spine; fourth day, right deltoid weak; fifth day, drowsy, temperature 105 F., color poor, intercostal muscles weak; 15 cc. antimeningococcus serum and 20 cc. poliomyelitis convalescent serum injected into muscle; following day, 20 cc. poliomyelitis convalescent serum injected into muscle	Temperature, 105 F.; feeble pulse; drowsy; face dusky; petechial rash; dilatation of alae nasi; barely audible voice; only abdominal respiration; quadriplegia; placed in respirator on admission	1 2 3 5 11 15 23 31	14 cm., 30 revolutions; coordinated with machine, quiet, color improved a little, pulse better quality Movements of diaphragm weaker than on admission; cyanotic after machine was opened for a few minutes Serum rash Could go about 5 minutes in good condition without respirator Could go about 1 hour without respirator; time out of respirator gradually increased Placed in respirator only at night Out of respirator Discharged to Bellevue Hospital
2 4311 5 yrs. 3 days	Fever, vomiting, loss of appetite	Stiff neck and back, hyperactive knee jerks, no paresis; temperature, 102 F.; pulse rate, 120; respiratory rate, 28; next day generalized weakness but no paralysis; third day, paralysis of all extremities; fifth day, respiration slow, irregular and shallow, weakness of intercostals, color fair	1	Condition in respirator good; taken out after 2 days; condition remained satisfactory; discharged after 22 days to an orthopedic hospital
3 4323 11 yrs. 6 days	Rigidity of neck; abdominal pain; admitted to another hospital with paralysis of both upper and later of both lower extremities; 4 days after admission respiratory difficulty, 45 cells in spinal fluid	Flaccid quadriplegia; drowsy; barely audible voice; used accessory muscles of neck; dilatation of alae nasi; face flushed; feebly abdominal breathing; no movement of chest; no cyanosis	1 2 10 11	12 cm., 15 revolutions; cooperated, seemed comfortable Unable to be out of machine for more than 5 minutes Out one half hour; then color became poor Out 15 hours; comfortable, color good but using accessory muscles; in 17 hours patient began to perspire and showed signs of distress; no respirator was available and patient therefore transferred to Kingston Avenue Hospital for respirator treatment
4 4830 12 yrs. 5 days	Fever, headache, backache	Drowsy, weak neck and back, flaccid quadriplegia, weakness of intercostals, feeble voice; next day breathing with greater difficulty, slight cyanosis; third day, patient quiet, only diaphragmatic breathing, feeble voice, dilatation of alae nasi, accessory neck muscles not used, perspiration, color fair, patient placed in respirator	1 2 3 10 13 14 17 18 22	12 cm., 30 revolutions; fell asleep shortly after being put in respirator Out 35 minutes; then color became poor; patient perspires, uses neck muscles Out half an hour without discomfort for next 6 days Patient complained of pain in throat, unable to cough or clear throat; out 1 hour and then used accessory muscles Out 2 hours; upper part of right side of chest flatter than left; impression, atelectasis Out 9 hours; then restless and cyanotic; while out respirator was used for a more urgent case Out 17 hours; then restless; slight return of intercostal movement Out 15 hours; replaced only at night Out entirely; after 30 days transferred to an orthopedic hospital
5 4556 10 yrs. 6 days	Headache; fever 2 days; next day weakness of one leg; vomited twice; admitted to another hospital; fifth day, paralysis of both lower extremities; sixth day, difficulty in breathing	Restless; shallow, rapid breathing owing to diminution of both intercostal and diaphragmatic contractions; voice weak; quadriplegia; placed in respirator immediately after admission	1 2 3-4 5 9 12	Fell asleep shortly after being placed in respirator Out 1 hour; breathed well, talked in whisper; color good; apprehensive at times Out 36 hours; then became restless and slightly cyanotic; replaced Out 30 hours; a little restless at times; replaced for several days Out 4 hours; when out of respirator color not good, perspiration, neck muscles used especially when talking; chest did not move; quieter in machine (18 cm., 30 revolutions); the psychologic reaction of the patient to suggestions by outsiders a great factor in his inability to remain out of the respirator for prolonged periods for several days Out of respirator entirely; color good; breathing regular and quiet; a little intercostal movement; after 28 days, discharged to an orthopedic hospital

Temperature and Pulse				
Day	Temperature	Pulse	Comment	Follow-Up
1	105	100	Twenty-third day: Roentgenogram showed no evidence of pulmonary infiltration; both hili enlarged owing to engorgement of pulmonary artery; vascular stem of cardiac shadow definitely enlarged; white blood cells, 10,000; polymorphonuclears, 65 per cent; red blood cells, 4,700,000; hemoglobin, 70 per cent	Three months after discharge: General condition good; never returned to respirator; speech good, voice loud and clear; no accessory muscles used; both abdominal and thoracic respiration; roentgenogram of chest normal; liquid petrolatum given daily
2	100-101	120		
3-4	101-103	120		
5-7	100	110		
7-31	99-100	110-120		
1-3	101-102	130		
1-3	101-102	130	First day: Spinal fluid under increased pressure, globulin and sugar normal, 270 cells, lymphocytes 60 per cent; serum, 3 cc. of antipoliomyelitis globulin intravenously; patient became restless, complained of headache and pruritus; injection stopped	Five months after discharge: General condition good; patient looked well, voice good; no obvious respiratory difficulty but breathing chiefly diaphragmatic with some movement of upper intercostals; tendency to constipation, obstinate at first; temperature normal; pulse rate from 90 to 112; respiratory rate from 20 to 22; died 8 months after discharge (details in text)
4-5	100-103	130		
6-7	100-101	120		
8-9	99.4-101	110		
10-22	99-100	110-120		
1	101-103	130	Tenth day: Roentgenogram showed no pulmonary infiltration; moderate enlargement of both hilar shadows; accentuated curve of right auricle pointed toward engorgement of the pulmonic artery	Six months after discharge: Placed in respirator immediately after admission to Kingston Avenue Hospital; after a time taken out for gradually increasing periods; 11 weeks after admission taken out of respirator entirely; 3 weeks later transferred to St. Giles Hospital where for 3 months condition remained satisfactory; at Kingston Avenue Hospital the temperature was always under 100 F. and the pulse rate from 110 to 130
2-3	100-102	110		
4-5	100-101	110		
6-8	100-102	120		
9	103-104.4	120		
10	102-104	130		
11-12	100-101	120-140		
13	99-100	130		
1-3	99-101	120	Second day: Lumbar puncture showed increased pressure, with 90 mononuclear cells; cisternal puncture showed increased pressure, with 35 cells; 100 mg. ephedrine sulphate injected into cistern; repeated following day; 5 cells in fluid. Sixth day: Roentgenograms of chest normal. Thirteenth day: Upper lobe of right lung showed marked density—atelectasis or consolidation. Seventeenth day: Persistence of shadow involving area from right upper lobe to fourth rib. Twenty-third day: Opacity almost entirely disappeared leaving a small marginal opacity at right upper lobe—may be remnant of former pneumonic process or former partial pulmonary collapse with reexpansion	Three months after discharge: General condition good; considerable return of function of intercostal muscles; temperature normal; pulse rate 90 to 100
4-30	99-100	90-110		
1	102	130	Twenty-seventh day: Roentgenogram showed large, heavy bronchial shadows; lack of usual separation of ribs; no gross chest lesions	Three and a half months after discharge: Little return in function of extremities; abdominal and upper thoracic respiratory movements; pulse rate at first 100 to 120, during last 2 weeks 90 to 100; temperature normal
2-16	100-101	120-130		
17-28	100	120		

TABLE 4.—*Patients with Sp*

Case No., Hosp. No., Age, Days Ill When Admitted	History	Examination on Admission and Course Before Artificial Respiration	Day	Course in Respirator
6 5349 14 yrs. 7 days	Headache and stiff neck; on third day, admitted to another hospital with paralysis of all extremities; respiratory difficulty on sixth day; treated by repeated lumbar punctures and hypertonic dextrose given by vein	Rigid neck; flaccid quadriplegia; talked in a whisper; shallow breathing; no thoracic and very little abdominal movement; used accessory neck muscles; slight cyanosis; placed in respirator on admission	1 2 3 4	Responded well Out for a few hours; alert, bright a comfortable; voice strong; breathing chiefly abdominal, but some movem of thorax Out 10 hours; requested to stay out machine; voice good; replaced for th night Out entirely; put to bed; discharged 14 days to an orthopedic hospital
7 4751 4 yrs. 6 days	Fever and some respiratory difficulty for several days; treated for pneumonia at home; weakness of extremities noted on the day of admission	Thorax moved very little; voice weak, gasping; right side of abdomen moved more than left; used accessory respiratory muscles; rigid neck and back; flaccid quadriplegia; placed in respirator on admission	1 2 3 9 10 12	Much improved; distressed if respirat was opened Moved lower extremities a little Out one-half hour for nursing care; well Out 2 hours; comfortable; pressure reduced to 4 cm.; color good; used m cles of neck when talking; voice weak intercostal movement fair Out during day; replaced at night Out entirely; did well; discharged aft 28 days to an orthopedic hospital
8 4304 8 yrs. 6 days	Pain in back, headache, nausea, vomiting	Obese; weak neck and back; paresis of lower extremities; sluggish patellar and achilles reflexes, absent abdominal reflexes; two days later extension of paralysis involving intercostal muscles; following day, patient apprehensive, voice weak, slight dyspnea; diminished intercostal movement; color good; placed in respirator on fourth day in hospital	1 2	Out 1 hour; comfortable Out entirely; did well; in respirator a total of 20 hours
9 5511 13 yrs. 6 days	Nausea, pain in back, stiff neck; admitted to another hospital on fourth day with paralysis of right upper extremity, weakness of left upper extremity and paralysis of both lower extremities, stiff neck and spine; spinal fluid by lumbar puncture under slightly increased pressure, with 130 cells; intercostal involvement on sixth day	Complete quadriplegia; paralysis of intercostals; weak abdominal respirations; did not use accessory respiratory muscles; voice weak; color good; placed in respirator on admission	2 4 6 12 14 18 23 24 25 28 29	Out 15 minutes; color remained good Out 5 minutes; then color poor Out 15 minutes; condition fair; out t gradually increasing intervals as long color remained good Out 1¾ hours Out 5 hours continuously Out entirely; condition good; little in costal movement Restless, irritable, breathed rapidly; and color good; did not use accessory muscles Out 2 hours for observation; condition not satisfactory; wanted to be out of machine Out 2 hours; then kept in for 36 hour Out for several 2 hour periods; condit satisfactory Out entirely; after 40 days discharged orthopedic hospital
10 5214 3 yrs. 4 days	Vomiting, fever, pain in neck; left hand weak; later difficulty in breathing; convalescent serum intramuscularly and intrathecally at home	Patient delirious, dyspneic; no intercostal movement; suprasternal retractions; no cyanosis; weak muscles of neck and back; paresis of both lower extremities and of left upper extremity; placed in respirator 4 hours after admission	2 7 9 14	Out several times, for 15 to 30 minut color and pulse good Out 4 hours continuously; color good Out 2 hours; condition good; time ou gradually increased Out entirely; condition good; after days discharged to an orthopedic hosp
11 5523 15 yrs. 5 days	Headache, fever, 5 days; legs weak, 3 days; left arm weak, 2 days; difficulty in breathing, 1 day; temperature always under 101 F.; lumbar puncture seven times, convalescent antipoliomyelitis serum given intrathecally three times	Neck rigid and back weak; gasping for air; color poor; diaphragmatic movement weak; chest expansion less on right; complete paralysis of left upper extremity and both lower extremities; paresis of right upper extremity; abdomen distended; placed in respirator on admission	1 6 16	Good color during nursing care outsid respirator Out 1 hour; condition good; kept out gradually increasing periods Out entirely; taken home after 23 day
12 5300 10 yrs. 4 days	Fever; headache; pain in neck and back	Rigid neck and back; paralysis of right upper and left lower extremities; paresis of left upper and right lower extremities; 20 hours after admission, difficulty in breathing; only abdominal breathing; color good; voice a little weak; patient perspired and was drowsy; placed in respirator	1 10 16	Felt well in respirator; asleep in 5 min Out 4 hours; condition satisfactory; out gradually increased Out entirely; discharged after 26 days an orthopedic hospital

Temperature and Pulse				
Day	Temperature	Pulse	Comment	Follow-Up
1 2-14	102 99-100	110 100-110	Sixth day: Roentgenogram of chest normal	Four months after discharge: General condition good; patient thin, alert, bright and happy; no obvious respiratory difficulty; considerable return of function of intercostal muscles, but breathing mostly abdominal, no accessory respiratory muscles used; voice clear; color good; constipation; temperature normal; pulse rate 80 to 92; respiratory rate, 20 to 22
1 2-28	102 99-100	120 120	On admission, spinal fluid under slightly increased pressure; 20 cells; globulin and sugar normal; white blood cells, 14,800; polymorphonuclears, 78 per cent; red blood cells, 4,300,000; hemoglobin, 55 per cent	Three and a half months after discharge: General condition fair; patient bright and happy; very little movement of thorax; voice good; color good; showed no signs of respiratory embarassment while lying in bed; temperature normal; pulse rate, 100 to 110
1-2 3-4 5-12 13-17	102-103 100-101 99-100 99-100	110-120 110 110 100	At orthopedic hospital, flat in bed for 5½ months; in good condition until day of transfer to Fordham Hospital for treatment in respirator; on that day cough and dyspnea suddenly developed, temperature 100.4 F.; chest on right side depressed; absent respiratory excursions; flatness on percussion of right side of chest with absent breath sounds and vocal fremitus; similar physical signs at Fordham Hospital; placed in respirator without change in condition; comfortable outside as well as inside machine, removed in 24 hours and kept out; diagnosis, collapse of lung on right side; roentgenogram 2 days later showed homogeneous shadow from apex to base, obliterating pulmonic markings; heart and trachea pulled to right; atelectasis of right lung; fourth day in hospital, dyspnea, cyanosis, difficulty in bringing up mucus; after 3 weeks, lung began to expand; in one month lung had expanded, heart and trachea in normal position; gradual improvement during succeeding weeks; constipation; required enemas or mineral oil daily; after 4 months, patient bright and alert, with no obvious respiratory difficulty; both thoracic and abdominal breathing; no difference between the two sides; deep inspiration called forth use of accessory respiratory muscles of neck	
1-2 3-4 5-33	102-104 100-102 99-100	120-130 110 100-120	Twenty-fifth day: Roentgenogram showed accentuation of pulmonary markings indicating vascular engorgement. Fourteenth day: Red blood cells, 4,600,000; hemoglobin, 70 per cent; white blood cells, 18,100; polymorphonuclears, 84 per cent. Twenty-seventh day: Red blood cells, 4,400,000; hemoglobin, 65 per cent; white blood cells, 11,600; polymorphonuclears, 70 per cent. At time of discharge some movement of upper intercostal muscles; used accessory muscles only when talking a long time	
1 2 3-12 13-18 19-23	103 101 99-100 99-100 99	110 80 80-100 100-120 120-140	First day: 65 mg. ephedrine sulphate given intrathecally; pressure of spinal fluid not increased; 150 cells. Twenty-third day: Roentgenogram showed a number of ill defined opacities through mesial and middle zones of Dunham, especially on left	
1-3 4-6 7-13 14-23	99-100.6 99-100 99-99.6 98.6-99.6	80-100 80-90 60-70 70-80	Fifteenth day: Roentgenogram showed no pulmonary pathologic condition; moderate enlargement of pulmonary markings indicating vascular congestion; red blood cells, 4,300,000; hemoglobin, 80 per cent; white blood cells, 11,100; polymorphonuclears, 84 per cent; persistent constipation and distention requiring enemas and colonic irrigations; at time of discharge fair movement of diaphragm and intercostal muscles	Two months after discharge (report by mail from mother): General condition fair; no pulmonary complications; voice and color good; breathing mostly abdominal; temperature always normal; pulse rate, 63; respiratory rate, 30; died 5 months after discharge (details in text)
1-2 3-4 5-25	102 100 99-100	120-140 90-100 100-130	Spinal fluid under slightly increased pressure; 110 cells, mostly mononuclears. Twenty-fourth day: Roentgenogram showed no evidence of pneumonia; patient required frequent enemas. At time of discharge there was no intercostal movement, the color was good and there was a quadriplegia	Four months after discharge: General condition fair; voice and color good; breathing mostly abdominal; some return of function of intercostal muscles; temperature normal; pulse rate, 90 to 100

TABLE 4.—*Patients with S*

Case No., Hosp. No., Age, Days Ill When Admitted	History	Examination on Admission and Course Before Artificial Respiration	Day	Course in Respirator
13 5000 8 yrs. 2 days	Fever; vomiting; headache	Neck rigid; back stiff; deep reflexes hyperactive; preparalytic poliomyelitis serum and 80 cc. convalescent poliomyelitis serum given by vein first day in hospital; third day in hospital, paralysis of both upper extremities; fourth day, paresis of lower extremities, breathing almost entirely abdominal, voice weak; placed in respirator	1 2 5 7 10	Objected to being placed in respirat removed in one-half hour; respirator distress gradually increased Replaced in respirator; more coopera condition good during intervals out nursing care Out 3 hours; comfortable Pressure decreased to 10 cm. and late to 6 cm. Out entirely; condition satisfactory; charged after 24 days to an orthope hospital
14 6459 5 yrs. 5 days	First day, headache, vomiting; third day, weakness of legs and arms; fifth day, difficulty in breathing	Rapid shallow breathing; diminution of both thoracic and abdominal breathing; right upper chest lagged; voice good; weak neck and back; paralysis of lower and paresis of upper extremities; distended bladder; after 22 hours, practically no movement of thorax; dilatation of alae nasi; color poor; perspiration; placed in respirator	1 3 6 8 11 19	Immediate improvement; color good Out 20 minutes Out one-half hour Out 3 hours; time gradually increase Out 9 hours Out entirely; discharged after 30 da an orthopedic hospital
15 4669 5 yrs. 5 days	Headache, fever, vomiting, drowsiness, and stiff neck; paralysis of left leg on day of admission	Patient drowsy, gasping for air, very little intercostal movement; neck stiff; flaccid quadriplegia; next day diaphragmatic involvement; patient cyanotic and stuporous; placed in respirator	1 3	Color improved; if respirator stopp minutes breathing became labored, color remained good Swelling of neck from tight rubber co removed from respirator; condition for 24 hours, then color poor, access respiratory muscles used; transferred Kingston Avenue Hospital where res pirator was available
16 4925 6 yrs. 4 days	Fever, constipation, pain in legs, back and neck; weakness of left leg; spinal fluid by lumbar puncture showed 180 cells, 95 per cent mononuclears	Stiff neck and back; flaccid paralysis of left lower extremity; weakness of right lower extremity; bilateral Kernig and Brudzinski signs; absent patellar and achilles reflexes; next day right deltoid and both lower extremities paralyzed; absent abdominal reflexes; bladder distended; third day, difficulty in breathing and talking, voice weak; breathing abdominal; placed in respirator	1 3 11 15	Comfortable; much improved Out 4 hours; then color poor; out n more than 1 hour at a time for the 7 days Out 2 hours; condition good; voice louder; some intercostal movement Out of respirator; condition good; u accessory muscles when talking; dis charged after 25 days to an orthope hospital
17 4325 3 yrs. 8 days	Headache, fever, drowsiness; two days later weakness of right arm and leg; admitted to Kingston Avenue Hospital on fourth day with paresis of right upper extremity and both lower extremities; abdominal reflexes absent; on sixth day beginning of weakness of intercostals; color became poor and patient transferred to Willard Parker Hospital	Right upper extremity and both lower extremities flaccid; shallow breathing; patient cyanotic and stuporous; dehydration; placed in respirator	1 2 3 6 7	30 revolutions, 14 cm.; color better; opened eyes in 15 minutes Out 20 minutes; condition good Removed from respirator to make r for emergency patient; quiet; color g Color seemed a little poor; replaced respirator Out of respirator; color good; gener condition satisfactory; some return function of right upper extremity; lo extremities as on admission; modera movement of intercostals and diaphr after 19 days discharged to an ortho hospital
18 5776 14 yrs. 3 days	Backache, 3 days; fever, weakness of legs, 2 days; weakness of arms, 1 day; rapidly progressing respiratory difficulty, 1 day	Quadriplegia; back and neck stiff; slight intercostal and diaphragmatic movement; voice weak; color fair; patient very obese (endocrine dyscrasia); temperature, 102 F.; pulse rate, 140; respiratory rate, 40; placed in respirator on admission	1 5 7 12 13 25 27	Cooperative; asleep in 1 hour; when pirator was opened a few minutes be restless and cyanotic and perspired p fusely; for 3 days unable to stop re pirator for more than 2 minutes Out 10 minutes; apprehensive; color Out 15 minutes; condition sasifacto time out of respirator gradually incr Out for two 1½ hour periods; color pulse good but asked to be replaced; respirations mostly thoracic Out for two 1½ hour periods; time increased 1 hour each day In respirator for only 4 hours during night; condition satisfactory Out entirely; discharged after 39 day orthopedic hospital for orthopedic c condition when discharged: voice goo patient breathed easily, but when ex or talking continuously used accesso muscles; quadriplegia of extremities splints; temperature, 99; pulse rate, respirations, 28

ions Who Survived—Continued

Temperature and Pulse				
Day	Temperature	Pulse	Comment	Follow-Up
3-4 5-24	100-101 99-100	100-120 100-116	Patient treated with serum in the preparalytic stage; respiratory paralysis developed. First day: Pressure of spinal fluid not increased; 450 cells; polymorphonuclears, 40 per cent. Fifteenth day: Roentgenogram showed emphysematous condition of lung tissue; moderate over-aeration of pulmonary fields. Twenty-fourth day: At time of discharge some movement of intercostals	Four months after discharge: Discharged from orthopedic hospital after 3 months; later observation in clinc; no respiratory difficulty at any time; breathing chiefly abdominal, but some movement of thorax
1 2-3 4-16 17-21 22-29	100 102.8-103 99-100 102-103 99-100	120 130 100-110 120 96	Spinal fluid under normal pressure; 136 cells, mononuclears. Sixteenth day: Red blood cells, 4,000,000; hemoglobin, 60 per cent; white blood cells, 9,000; polymorphonuclears, 68 per cent. Twentieth day: Roentgenogram showed moderate enlargement of right hilus shadow; left hilus not visualized, disappearing in heart shadow; evidence of moderate vascular engorgement	
1 2 3 4-6	100 101 104 99	140 140 140 130	On first day in hospital patient received 90 mg. ephedrine sulphate intrathecally; spinal fluid under slightly increased pressure; 85 cells; constipation	Placed in respirator for 4 days; satisfactory progress out of respirator for following 3 days; during next 11 days had three sudden attacks of severe respiratory distress (first associated with fever and lasted 2 days; second lasted a few hours; third fatal a short time after the onset of the symptoms); no autopsy
1 2-3 4-6 7-25	100-102 101-103 99.4-101 99-100	130-140 110-140 130-140 130-140	Did well at orthopedic hospital for 1 month; respiratory distress suddenly developed and patient transferred to Bellevue Hospital; placed in respirator without improvement; following day temperature 104 F.; dulness, diminished fremitus, decreased breath sounds and coarse moist râles over both lungs; temperature high; after 4 days patient died; no autopsy	
1-2 3 4-5 6-7 8-18	101-102 99-100 102 99-101 99-100	140 140 140 130 130-140	For 9 days condition satisfactory; on sixteenth day development of respiratory distress; expansion on right side of chest diminished; over upper part of right side bronchovesicular breathing and increased fremitus, and over lower part absent fremitus and almost absent breathing; no fluid obtained by thoracentesis; roentgenogram revealed dense shadow involving entire right side, temperatrue rose to 104 F.; the child died; no autopsy	
1-2 3-7 8-14 15-39	101-102 101- 99 101- 99 100- 99	130-140 100 120 120	Sixteenth day: Roentgenogram showed no evidence of pneumonia; diminished illumination of lower half of left lung (may be due to thickened pleura). Twenty-eighth day: Red blood cells, 4,400,000; hemoglobin, 55 per cent; white blood cells, 8,560; polymorphonuclears, 70 per cent. Thirtieth day: Roentgenogram showed no pneumonia	After 10 days of uneventful convalescence, was discharged to home in good condition; at home, on day of discharge, suddenly became ill and had some convulsive movements; 12 hours later was admitted to another hospital in coma; temperature, 103 F.; dyspnea; cyanosis; diminished expansion of right half of chest; no improvement in respirator; died 10 hours after admission; autopsy report showed congested vessels on the surface of brain; no epidural or subdural hemorrhages; lungs voluminously enlarged; moderate congestion at bases; heart normal

TABLE 5.—*Patients*

Case No., Hosp. No., Age, Days Ill Before Admission	History	Examination on Admission and Course Before Artificial Respiration	Day	Course in Respirator
19 4586 1½ yrs. 5 days	Fever; vomiting; inabilty to walk	Quadriplegia; weak neck and back; next day difficulty in breathing and color poor; respiration chiefly abdominal; placed in respirator	..	30 revolutions, 10 cm.; did not synchronize with machine, but color improved after a short time; condition soon came worse; patient died after 18 h in respirator
20 4298 20 mos. 4 days	Drowsiness; irritability; fever; paralysis left upper extremity 1 day; spinal fluid by lumbar puncture at Bellevue Hospital showed 35 cells	Paralysis of left upper extremity and weakness of both lower extremities; weakness of neck and back; shallow breathing; dilatation of alae nasi; color poor; patient restless and stuporous; placed in respirator shortly after admission	..	Did not synchronize with machine, color improved for a short time; so afterward, patient cyanotic, vomit died after 8 hours in respirator
21 5432 15 yrs. 3 days	First day, vomiting and pain in abdomen; second day, pain in neck, paralysis of legs, required catheterization; third day, difficulty in breathing	Rigid neck and back, paralysis of both legs; bladder distended; greatly diminished intercostal movement; voice and color good; 7 hours later breathing became labored, accessory muscles were used and voice became weak; placed in respirator	1 2	Cooperated; color good Diaphragmatic paralysis; color poo soon as machine was stopped; died 36 hours
22 5717 19 yrs. 5 days	First day, headache, stiff neck, vomiting; second day, temperature 103 F.; fourth day, difficulty in breathing in afternoon; admitted to hospital at 5 a. m.	Temperature, 103 F.; patient restless, hyperesthesic and dyspneic with generalized tremors; weakness of neck, back and legs; paresis of both arms; greatly diminished intercostal movements; color at times poor; placed in respirator immediately	1	Much improved in respirator but w apprehensive; color good but restless increased; at times irrational; wante be taken out of machine; when respi rator stopped, condition became rap worse; vomiting; color and pulse bec poor; the patient died in 36 hours
23 5404 7 yrs. 4 days	First day, pain in back and neck, fever; third day, headache; fourth day, difficulty in breathing	Quadriplegia; patient dusky, perspiring; shallow abdominal breathing; used accessory muscles of neck; voice inaudible; placed in respirator	..	Resisted action of machine; color n improved; vomited; rapidly worse; in 5 hours
24 4281 4½ yrs. 3 days	Headache; fever; weakness of right leg	Patient acutely ill; stiff neck; weakness of both lower extremities; absent patellar, achilles and abdominal reflexes; temperature, 102.4 F.; pulse, 130; respirations, 40; next day weakness of both arms; intercostals weak; voice weak; patient beginning to use accessory muscles; color became rapidly worse; placed in respirator	..	30 revolutions, 15 cm.; color improv for a short time, but patient died 4 hours
25 5103 6 yrs. 5 days	Headache; weakness of legs; patient unable to sit up	Weakness of neck and back; left upper and lower extremities paralyzed; paresis of right upper and lower extremities; abdominal reflexes absent; the next day, quadriplegia; intercostal paralysis, using accessory muscles; perspiring, drowsy, dusky; placed in repirator	..	Color improved; patient fell asleep; difficulty in swallowing developed patient died in 46 hours
26 4959 18 yrs. 4 days	Fever; vomiting; pain in neck and extremities	Patient acutely ill; drowsy and dyspneic; rigid neck and back; paresis of all extremities; no thoracic and diminished abdominal breathing; voice barely audible; color poor; placed in respirator	..	15 revolutions, 15 cm.; asleep in 5 m utes; color much improved; 3 hours later pulse became poor; color chan to a dusky ashen; patient died in 6 hours
27 4117 14 mos. 5 days	Patient had a cold with fever; later weakness of legs and arms	Quadriplegia; abdominal breathing; color good; vocal power diminished; on following day respiratory difficulty increased; placed in respirator	..	Color improved for a time, but cond soon became worse and patient di 9 hours
28 4934 21 yrs. 3 days	Patient drowsy; malaise; fever; backache; headache; constipation; patient unable to void	Rigid neck and back; both legs paralyzed; bladder distended; on third day upper extremities weak and diaphragm paralyzed; color poor; placed in respirator	..	15 revolutions, 20 cm.; color did no prove; vomiting; patient did not r and died 36 hours after being placed respirator
29 4359 2½ yrs. 5 days	Fever; weakness of legs and arms	Weakness of neck and back and all extremities; distended bladder; next day rapidly increasing respiratory difficulty; both diaphragmatic and intercostal weakness; an ashen cyanosis developed; placed in respirator	..	Patient improved and color better minutes; soon condition became w color poor; patient died in 1½ hour
30 5262 21 yrs. 3 days	Pain in lower part of back; vomiting; headache; patient unable to stand	Acutely ill but mentally alert; neck and back stiff; paresis of both lower extremities; bladder distended; temperature, 100.6 F.; pulse rate, 128; next day beginning difficulty in breathing; third day only abdominal breathing, slight cyanosis and restlessness; placed in respirator	..	Condition did not improve; pulse thready; died in 19 hours

Day	Temperature and Pulse: Temperature	Temperature and Pulse: Pulse	Comment	Pathologic Picture
	102.6 103.4-105	140 160	.....	Right lung normal; left lung dark red and solid in consistency and has the appearance of liver, resembling an old organized pneumonia; microscopically a marked amount of emphysema; other large areas where the alveoli are completely consolidated and filled with serum and leukocytes; entire cord shows an extensive acute reaction* which is also present, but to a lesser degree, in the cerebellum and bulb
	104	170	.....	A few scattered areas of atelectasis in both lungs, but lungs otherwise normal; microscopically, a marked amount of atelectasis with adjoining areas of emphysema; moderate to marked acute reaction throughout the entire cord and bulb
1 2	101-103 103-105.4 105.4-105	100 120 120-100	Spinal fluid under slightly increased pressure; 210 cells, mostly mononuclear; globulin normal	
	103.2 101.6-105	100 130	45 cc. convalescent serum given by vein on second day of illness; after admission, 100 cc. of 25% dextrose given by vein; spinal fluid count before admission, 300 mononuclear cells	
	102-104	160		
1 2	102.4 103-104	130 140-150	Spinal fluid under slightly increased pressure; 240 cells, 94 per cent mononuclears	Permission granted for examination only of central nervous system; extensive acute reaction throughout entire cord and medulla; multiple fair-sized focal lesions in pons with slight edema; similar condition with fewer lesions in cerebellum; cortex shows only slight edema and congestion; moderate amount of meningeal reaction around cord
1 2 3	102.8 99-101 103.6-100	130 130 110-160	.....	Both lungs show a marked amount of atelectasis and a slight amount of congestion; microscopically, moderate alveolar emphysema, atelectasis, congestion and edema; no definite pneumonia; an extensive acute reaction in the entire cord and medulla; a slight amount of acute reaction in the cortex
1 2	103 105	120 130	.....	Both lungs show a marked amount of congestion and edema; microscopically, a moderate amount of emphysema with thinning and rupture of the alveolar walls; an extensive amount of exudation into the alveolar spaces; an extensive acute reaction throughout entire cord, less pronounced in medulla and internal capsule; slight edema and congestion with a little hemorrhage in the cortex
2 3	101-103 102-104.6	130-150 170	Spinal fluid under increased pressure; 320 cells	
1 2 3 4	102.2 101-103.6 101-102.6 103.6-105	100 90 110 120	Spinal fluid under slightly increased pressure; 30 cells; increased globulin	
1	102-104.4	130-140		
2 3 4	101.6-102.4 100-103 103-104.6	110 100 110	Spinal fluid under slightly increased pressure; globulin increased; 540 cells, mostly mononuclears	

TABLE 5.—*Patients with Sp*

Case No., Hosp. No., Age, Days Ill Before Admission	History	Examination on Admission and Course Before Artificial Respiration	Day	Course in Respirator	Day
31 5095 9 yrs. 5 days	Vomiting; pain in back of neck; next day stiffness of neck; fourth day, difficulty in breathing	Spine rigid; quadriplegia; paralysis of intercostal muscles; color good; placed in respirator on admission	..	Did well for 24 hours; then patient stuporous, perspiring, color poor; 28 hours after being placed in respira	1 2
32 4263 3 yrs. 4 days	Fever; vomiting; weakness of legs	Patient acutely ill; weakness of neck and back; paralysis of both lower extremities and deltoid muscles; third day, both arms flaccid; beginning intercostal paralysis; fifth day, slight cyanosis, dilatation of alae nasi, evidence of diaphragmatic paralysis; placed in respirator	1 3 6	30 revolutions, 14 cm.; fell asleep shortly after being placed in respira Out 20 minutes; did well; time out respirator gradually increased Out 36 hours; quiet, apparently co fortable; a few minutes after bein in good condition was found gaspi for air, cyanotic and pulseless; pla respirator immediately; condition proved temporarily, but patient die 12 hours later	1 2 3-4 5-9 10
33 5047 4 yrs. 3 days	Vomiting; stiff neck; weakness of right arm; fever	Acutely ill, neck stiff and back rigid; paralysis of both upper and paresis of both lower extremities; color poor, perspires, abdominal breathing; placed in respirator 4 hours after admission	..	Color improved, but 2 hours later vomited and became cyanotic; unab to do without respirator for even a minutes; died in 24 hours	1 2
34 5070 8 yrs. 7 days	Headache; fever; paralysis of arms	Acutely ill, restless, flaccid paralysis of upper and weakness of lower extremities; neck and spine stiff; only abdominal breathing, dilatation alae nasi, voice weak but color fair; placed in respirator	..	30 revolutions, 15 cm.; first objected machine, later fairly comfortable 9 hours condition became rapid color poor; restless; died in	

large amount of the serum transudate and of the emphysema to the use of the respirator. We agree with this opinion, and think that considerable injury can occur in a short time, as illustrated by case 36. This child was in the respirator for only one hour. Postmortem examination showed a loss of normal elasticity of both lungs and a marked amount of congestion and emphysema, with thinning and often rupture of the alveolar walls.

NOTE.—Two additional children (cases 2 and 11) have died since this article was written. One child, seven months after her discharge from Willard Parker Hospital, had scarlet fever which was complicated by varicella. She had made an apparently uneventful recovery from both diseases, when six weeks after the onset of the scarlet fever a high temperature and dyspnea suddenly developed. The clinical impression was that the child had pneumonia, but a roentgenogram showed what the roentgenologist considered a partial pneumothorax. The patient was kept alive for eight days in a respirator. During the entire time she appeared to be in a moribund condition. During the last few days there were definite physical signs of pneumonia. Autopsy revealed pneumonia involving all lobes.

Information concerning the second child was obtained by a letter from the mother. Five months after discharge from Willard Parker Hospital the child became acutely ill. The attending physician made a diagnosis of pneumonia. Oxygen was administered, but the child died in a few days.

sions Who Died—Continued

Temperature and Pulse				
Day	Temperature	Pulse	Comment	Pathologic Picture
1	102-103.6	130	Spinal fluid pressure normal; 60 mononuclear cells	
2	103-105	160		
1	104	140	Spinal fluid under slightly increased pressure; cells increased, 90 per cent mononuclears; red blood cells, 4,600,000; hemoglobin, 60 per cent; white blood cells, 10,500; polymorphonuclears, 78 per cent	
2	101-102	130		
3-4	102-104	140		
5-9	101-102	130		
10	102-108	140		
1	104.6	130	Spinal fluid under slightly increased pressure; 180 cells; 85 per cent mononuclears	Marked amount of congestion in both lungs; microscopically, marked amount of emphysema; many hemorrhagic areas where red blood cells fill the alveolar spaces and the blood vessels are engorged; extensive acute reaction in the medulla, also throughout the cord, but with a less pronounced nerve cell degeneration than in other cases; moderate edema, congestion and hemorrhage in the cortex and internal capsule; slight reaction in the cerebellum
2	102-104	100		
	104-106	130-140	Spinal fluid under slightly increased pressure; globulin increased; 166 cells	Permission granted only for examination of the spinal cord; extensive acute reaction, bilateral, in lumbar and thoracic levels; unilateral in the cervical levels

* Acute reaction includes edema, congestion, hemorrhage, nerve cell degeneration and necrosis.

COMMENT

Our experience has taught us a few helpful general points which we wish to emphasize. The medical and nursing care of the patient, aside from the artificial respiration, must be kept in mind. The timely administration of sedatives and parenteral injections of fluid, laxatives or other medication will avoid interference with the artificial respiration. It is well to have a time schedule for turning the patient on his side or abdomen. In some of the new respirators the patient can be tilted so that postural drainage is possible. This will be helpful in many cases. Every effort should be made to prevent a rise in temperature of the air inside the respirator. It may be necessary to pass the inflowing air through a tank of ice, such as is used in cooling oxygen in the treatment of patients with pneumonia. Since it is not possible to tell whether a patient will need treatment in the respirator for a few days or for several weeks, the paralyzed skeletal muscles require attention. Sandbags or other simple means of support are most desirable at first. Later the orthopedic surgeon should apply plaster splints or whatever he deems advisable.

In some instances removal of the patient from the respirator was not a simple matter. Many children and some adults became very restless when the motor was stopped. These patients were "weaned" away from the use of the machine, as Wilson aptly expressed it. The simplest method is to lower the pressure gradually and to permit the motor to run. The patient then breathes of his own accord inside the chamber, but still hears the hum of the motor. A good nurse at this stage is invaluable.

Until the apparatus, the technic of treatment or both are improved we do not advise the treatment of patients with slight or moderate respiratory distress in the respirator. Repeated small doses of sedatives and continued reassurances will make such patients comfortable and enable them to rest. However, when a patient has involvement of the respiratory muscles he should be in a hospital near a respirator, because there is no way of telling whether the condition will become worse. In addition, we do not, at present, advise treatment in the respirator for long periods after sufficient respiratory function has returned to permit the patient to lie comfortably in bed. Our attitude toward both the selection of cases for artificial respiration and the prolonged after-treatment is based on the pulmonary pathologic conditions found in patients after treatment in the respirator, the pulmonary complications occurring in patients who survived and the physiology of respiration.

The twelve patients with bulbar lesions, apparently associated with involvement of the vital centers, all died. Among the patients with only spinal lesions, twelve died in the respirator and four within six weeks after treatment. One subsequent death five months after treatment was reported to be due to pneumonia. Another death, which occurred seven months after the patient's discharge, was due to pneumothorax and pneumonia. In brief, after seven months twelve of the thirty-four patients with spinal lesions are alive. This does not compare favorably with the results in cases of spinal lesions reported by Wilson.[9] He had three deaths among his twenty-three patients; however, many of them were not in urgent need of artificial respiration. He advised that the respirator "be used early, long before the appearance of cyanosis, before there is evidence of marked dyspnea and at the very first evidence of the existence of any paralysis of the respiratory muscles." We observed many children with moderate respiratory difficulty who were not treated in the respirator. This to some extent accounts for the marked difference in the mortality rate in our series and in that reported by Wilson.

9. Wilson, J. L.: Acute Anterior Poliomyelitis, New England J. Med. **206**: 887 (April 28) 1932.

We mention this without wishing in the least to detract from his good results. At present, even did we approve of treating patients at the first evidence of paralysis of the respiratory muscles, it would be a practical impossibility. Respirators are so expensive that the number available at any one institution is limited, and during an epidemic only the patients with the more urgent cases can be treated. For the same reason it would be impossible to give more than a few patients prolonged treatment in the respirator after they had regained the use of their respiratory muscles.

The only other series of cases reported is that by Shaw and his associates.[10] They treated ten patients with paralysis of the diaphragm and intercostal muscles, with three deaths. Five other patients with bulbar lesions all died.

The Drinker respirator represents an outstanding advance in the treatment of respiratory failure in poliomyelitis. With improvement in the apparatus and in the technic of treatment, the mortality among patients who would die of respiratory failure should be greatly decreased. There are other causes of death in poliomyelitis, and in these cases the respirator can be of little assistance.

SUMMARY

The treatment of patients with respiratory failure due to acute epidemic poliomyelitis is described in detail.

Pertinent points in the history, course in the hospital and follow-up or postmortem examination are given for the forty-six cases individually, and the data are summarized and discussed.

10. Shaw, E. B.; Thelander, H. E., and Limper, M. A.: Respiratory Failure in Poliomyelitis, California & West. Med. **35**:5 (July) 1931.

SOME REFLEX CHANGES IN POLIOMYELITIS

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In clinical studies of poliomyelitis made in the past ten years by my associates and me some marked changes were found in reflex activity which, though mentioned in a general way in the literature, have not been thoroughly analyzed. We became particularly interested in the changes that occur in the abdominal, the cremasteric and the quadriceps tendon responses.

This article deals with the results of our studies on these reflexes in normal and in pathologic conditions, with especial reference to their occurrence in 386 cases of infantile paralysis.

SUPERFICIAL ABDOMINAL SKIN REFLEX

When the abdomen of a normal subject was stroked lightly, there was a flickering response over the area stimulated. When analyzed carefully, this abdominal reflex response was found to be nearly specific for the separate quadrant irritated. This was the finding of Langworthy,[1] Monrad-Krohn [2] and Astwazaturow.[3] If forceful stimulation was applied, it caused aberrant overplay and usually a massive *en gros* reaction, sometimes not only of the stimulated side, but of the other side as well. This mobilized flexor response to more active stimulation was probably part of a more generalized defense mechanism, not a true abdominal reflex response, and it should not be confused with the acknowledged abdominal skin reaction. Langworthy [1] mentioned the occasional undulating response of the oblique and transverse muscles. In our experience, this reaction followed continuous slow stroking. This summation reaction is likewise not an abdominal reflex in the strict sense of the word. In hyperexcitable persons and people with overly sensitive skins, often as a result of underlying disease, the force of the

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1. Langworthy, Orthello R.: The Mechanism of the Abdominal and Cremasteric Reflexes, Arch. Neurol. & Psychiat. **24**:1023 (Nov.) 1930.

2. Monrad-Krohn, G. H.: The Abdominal Skin Reflex, quoted by Peter Bassoe, in Practical Medicine Series, Chicago, Year Book Publishers, 1919, vol. 8, p. 8.

3. Astwazaturow, M.: On the Nature of Abdominal Reflexes, J. Nerv. & Ment. Dis. **61**:587, 1925.

applied stroke would have to be considered. In short, there were three possible reactions in the abdominal area, dependent on whether the stimulation was light, continued or deep.

When I speak of the skin abdominal reflex response in this article, I mean the reaction which was obtained after light stimulation, a flickering response of the cutaneous wall.

For technical reasons, we did not try to elicit the individual response of the supra-umbilical, para-umbilical and infra-umbilical abdominal cutaneous areas, but divided the abdomen into four quadrants, as did Rolleston,[4] above and below on each side of the umbilicus, so that we could more easily study this reflex from a clinical standpoint. Rolleston[4] technically terms these areas the supra-umbilical and infra-umbilical skin reflex zones.

It was soon noted that normally there was greater activity of response to the same strength of stimulus applied to the upper than to the lower quadrants. Likewise, in normal persons it was found that there was a natural variation in the comparative degree of reaction, the lower part of the right side being slightly less responsive than the left.

Under certain circumstances, these abdominal skin reflexes might become hyperactive, absent or less than normally active. The range of normalcy from slight to obvious activity, from decreased to lost reflex response was so wide that credence could not be given to shades of elicited difference unless the hyperactivity nearly approached a tonus spasticity or the decreased response was obvious.

Reactions Among Patients with General Conditions Admitted to the Hospital.—Müller and Seidelmann[5] found the cutaneous abdominal reflex present in all but 1 of 3,000 persons. We tried to obtain this response in more than 1,600 persons admitted to the contagious division and other divisions of the hospital (220 adults and 1,180 children who did not have neurologic diseases), and the reflex was found acutely active, except under the following conditions: (*a*) when the patient voluntarily held the abdomen tense; (*b*) when he laughed or cried; (*c*) in some persons in whom the abdominal layers were lax (20 of 60 patients); (*d*) when there was a massive pad of fat over the abdomen (31 out of 31 cases), and (*e*) in most new-born infants.

Reaction of Abdominal Skin Reflex in Other Diseases.—The reflex was modified: (*a*) in every case in which the corticospinal pathway was interrupted, as in multiple sclerosis; (*b*) when tumors had stretched the abdominal wall (2 of 3 cases of ovarian cysts, fibroids and other

4. Rolleston, J. D.: The Abdominal Reflex in Enteric Fever, Brain **29**:99, 1906.

5. Müller, E., and Seidelmann, W.: Zur Physiologie und Pathologie der Bauchdecken-Reflexe, München. med. Wchnschr. **52**:1323, 1905.

growths); (*c*) when ascitic fluid filled the abdomen (8 of 9 cases); (*d*) when there were infiltrations or inflammations in the abdominal wall (18 of 18 cases); (*e*) in many prepartum cases (45 of 79 cases); (*f*) in many postpartum cases (41 of 50 cases); (*g*) in certain stages of typhoid fever (to be described later); (*h*) in 2 cases of food poisoning, with constipation and probable paralysis of the intestines; (*i*) in early hemiplegia (7 of 7 cases); (*j*) when peritoneal inflammatory exudate filled the abdomen and distended its walls (4 of 4 cases), and (*k*) in 24 of 30 cases of tuberculous meningitis.

This reflex was hyperactive: (*a*) in many cases of appendicitis (10 of 51 cases); (*b*) in early cases of gastric ulcer (7 of 18 cases); (*c*) in cases of acute early peritonitis (3 of 8 cases); (*d*) in disease of the gallbladder (5 of 15 cases); (*e*) in renal colic (6 of 6 cases); (*f*) in chorea (3 of 3 cases); (*g*) in tabes dorsalis (2 of 2 cases); (*h*) in paralysis agitans (5 of 5 cases), and (*i*) in the postencephalo-pseudo-parkinsonian syndrome (3 of 3 cases). Later in such conditions as appendicitis and gastric ulcer, the tonic mobilization of the abdominal wall prevented a reflex response.

In conclusion, the reflex was lost whenever the abdominal wall was mechanically distended or infiltrated or in the presence of disease of the pyramidal tract. It was often hyperactive in the early stages of any disease of the hollow viscus, but was usually unresponsive in the stage of muscle mobilization.

Reaction of the Reflex in Poliomyelitis.—In this condition, the reflex response varies: 1. It may be absent on one or both sides. 2. It may be normal after one or two stimulating strokes and lost with further repetitions of applied force of the same strength. In such cases, there is frequently a reappearance of the reflex ability after a rest interval; this is again followed by tiring on subsequent stimulation. 3. The reflex may be present but weaker in response to stimuli on one side than to the same stimuli on the other or normal side. 4. It may not respond to stimulation in the lower part of one side toward the symphysis, but may respond normally in the upper part of the same side. 5. The reflex may be markedly hyperactive either in a single quadrant or all over the abdomen. We saw this irritative type of reaction only in the initial stages of the disease. 6. The reflex may be unaffected or not demonstrably changed in rare instances.

Time of Reflex Changes in Infantile Paralysis.—The reactions noted were those which one would expect in a lesion of the efferent fibers such as is present in anterior poliomyelitis. It was only when the circumstances under which this reaction was modified were examined that the truth of this belief began to be questioned.

We were able to tabulate the reflex response in relation to the initial somatic paralysis and at various intervals of time after the incipiency of the disease. The results are given in the following paragraphs.

Reaction of Abdominal Skin Reflex in Relation to Somatic Paralysis: (*a*) The reflex was modified in 8 or 9 cases of polio-encephalomyelitis, that is, cortical poliomyelitis without somatic paralysis. (*b*) Even though the abdominal muscles could be voluntarily activated with ease at the time of first examination, the reflex was modified in 342 of the 386 cases. (*c*) It was modified on one side of the abdomen when paralysis occurred in the leg of the opposite side in 28 cases. (*d*) It was modified in all of the 12 preparalytic cases seen. (*e*) It was modified in 15 of the 17 abortive cases in which somatic paralysis did not develop. (*f*) It was not definitely disturbed in only 15 of the 386 cases of infantile paralysis, and 11 of these 15 patients were admitted to the hospital late in the course of the disease.

Reaction of Abdominal Reflex in Relation to Somatic Paralysis from Ten to Twenty-One Days After Onset of Paralysis: As the patient became better, the response of the abdominal reflex to stimuli was about the first thing to return to normal. Thirty-nine of our 386 patients died. Two hundred and ninety-four of the remaining 347 patients showed normal reflexes by the tenth to the twenty-first day after admission. In the remaining 53 cases, there was massive involvement of the muscles of the body, with somatic paralysis also of the abdominal recti. In these cases, any response to stimulation was lost because of the obvious involvement of the efferent nerves.

The most astonishing thing was that the reflex was lost often before and usually at the onset of somatic paralysis, and that in most instances the reflex was recovered within from ten to twenty-one days after the patient's admission to the hospital, though the somatic paralysis might still persist.

Comment.—As has been stated, it could be said that the loss of the abdominal reflex response was due to a break in the somatic reflex arc in the region of the anterior horn cell, and that the resulting condition was due to paresis or paralysis of the voluntary musculature, by reason of which there was no efferent response to stimulation of the afferent fibers of the reflex arc. That this is not an accurate explanation was easily seen when modification of this reflex response was found in patients with paralysis of nerves distantly removed segmentally from the nerves which supply the abdominal muscles (in 20 of 23 cases of involvement of the arm or arms only). That it is not an accurate explanation was seen from the fact that the reflex was found modified,

that is, absent or occasionally hyperactive, in 12 of 12 cases of poliomyelitis in which the patients were seen in the preparalytic stage of the disease.

It seems obvious that some other explanation must account for the change in the reflex under the conditions noted in the foregoing paragraphs, since it would be difficult for one who contended that this change was somatic in character to explain why the change in the abdominal reflex occurred coincident with or before somatic paralysis existed, and why it reappeared though somatic paralysis persisted.

Monrad-Krohn [2] stated that the reflex had a long cerebral arc, an arc through which the rubral system exercised a controlling or impeding influence, so that there would be a loss of the abdominal skin reflexes in cortical capsular, mesencephalic or spinal interruptions of the corticospinal pathways. Asturazaturow [3] believed that the reflex was phylogenetically a new acquisition which gave a "manifestation of the tone of the belly wall muscles, a reflex elaborated in the process of evolution during the period of development of plantigrade primates." He called it a "neoreflex" elaborated in the process of acquiring the erect posture, and stated that in lesions of the pyramidal tract, when the nervous system is at its lowest degree of evolution, the abdominal reflexes and other recent acquisitions would be lost or decreased. In contrast, Aronovitch [6] called attention to the fact that under the same conditions the deep reflexes would naturally be increased, since they are more primitive, or older, reflexes.

All this presupposes a lesion or irritation of the pyramidal tract, but one can dismiss the idea of a lesion of the pyramidal tract in this condition, since there is no other evidence of involvement of the pyramidal tract. There is no Babinski sign, as primitive a reaction as the deeper tendon responses; there is no ankle clonus or sign of knee jerk irritation after the occasional first few days of hyperactive reaction. The loss of this reflex response was not necessarily the result of weakness or paralysis in the abdominal areas, since in most cases these areas can be voluntarily activated with ease, though the abdominal skin reflex response may be absent.

It is curious that the abdominal reflex is the only skin reflex in the body, and that this reflex is modified in early infantile paralysis. It may be that the acquisition of tone in the abdominal area might be a part of an acquired defense mechanism to protect an otherwise undefended area.

Even though this tonal loss does not go hand in hand with a total loss of protection afforded the abdominal contents by the abdominal

6. Aronovitch, G.: On the Nature of the Cremasteric Reflex, J. Nerv. & Ment. Dis. **64**:235, 1926.

wall, tone plays a part in disease conditions of the internal organs, since diseases of an internal organ give rise to reflex reactions of the somatic musculature the nerve origin of which is from the same segment of the cord as that of the internal organ. This is the so-called "visceromotor reflex." In short, sympathetic stimuli are translated into somatic action by way of the thoracolumbar and spinal systems. This effect is obtained by irritation of the thoracolumbar system. Most of the studies of MacKenzie and his pupils have been made on clinical irritative reactions causing untoward stimulation of the sympathetic system and referred pain.

If sympathetic stimulation increased tone and hence hyperactivity, what would be the effect of thoracolumbar disconnection? Animals do not have an abdominal reflex. Therefore, experimental data are lacking.

One of the best bits of evidence toward establishing the fact that the disturbance of this reflex is due to gastro-intestinal disease is gained by a study of the reflex response in typhoid fever. Years ago Rolleston [4] found that the abdominal reflex was often lost in this infection where there was a pure gastro-intestinal focus. All of the patients with severe cases of typhoid examined by us have shown the loss of this abdominal reflex at some time during the course of the infection. Clinically, in typhoid fever the patient is better when the abdominal reflex reappears, and it is at this time that the color of the excreta begins to change. In short, the return of these reflexes corresponds to the time when intestinal tone has returned. This set of clinical facts parallels those present in infantile paralysis.

The loss of abdominal reflexes is usually explained on the basis of an interruption of the corticospinal pathway. Riddoch [7] studied patients with transected cords and found that the abdominal reflexes actually reappeared, some as soon as six days after the infliction of the wound. This fact, if true, would vitiate the assumption that interruptions of the corticospinal pathway caused a permanent loss of the abdominal skin reflex, and one could conclude that the cerebrospinal tract had no influence over these responses. Monrad-Krohn,[2] however, explained the reactions obtained by Riddoch as being part of a flexor defense mechanism and not a true abdominal skin reflex.

It was an old opinion that infantile paralysis was a disease of a gastro-intestinal nature.[8] On the basis of this hypothesis, convalescent

7. Riddoch, George: The Reflex Functions of the Completely Divided Spinal Cord in Man Compared with Those Associated with Less Severe Lesions, Brain **40**:264, 1917.

8. Wickman, Ivar: Acute Poliomyelitis (Heine-Medin's Disease), translated by W. J. A. M. Maloney, Washington, D. C., Nervous and Mental Disease Publishing Company, 1913, monograph no. 16.

poliomyelitis serum has been injected into guinea-pigs to neutralize successfully the effect of the subcutaneous injection of infantile paralysis stool emulsions.[9] The epidemiologic prevalence of the disease bore some resemblance to such gastro-intestinal diseases as typhoid fever [10] and dysentery,[11] the incidence peaks of which occur at about the same time as the incidence peak of infantile paralysis.[12] In further studying patients with infantile paralysis, we found that they invariably had some gastro-intestinal complaint, either diarrhea, constipation, nausea, vomiting, pain in the abdomen or some combinations of these symptoms. We felt that the arguments given could constitute reasons for tentatively considering infantile paralysis a gastro-intestinal disease. Were it such a disease, we could deduce that the poison causing the disease might be absorbed from the gastro-intestinal tract by the sympathetic system, as did Sicard,[13] and add that via this pathway it reached the somatic nerve and cord.

To explain the reflex findings in this light, one might say that the poison which caused the infection could be absorbed along the local gray matter by the excitor neuron, whether it was sympathetic or parasympathetic in origin. The disease would usually spread caudad with the propulsed intestinal contents and with the gradient. In certain instances in which the poisoning was massive, it might be conceived as directing itself cephalad along the gray fibers that lie between the sympathetic ganglions to the cervical area or even leap the synaptic bounds to involve the connector fibers themselves.

THE CREMASTERIC REFLEX

The ordinary reflex reaction seen when the skin of the front or inside of the thigh is gently stroked is expressed by a contraction of the testis on the same side as the applied stimulation. The innervature of this reflex arc is from the eleventh and twelfth thoracic and the first and second lumbar nerves. This reflex has been alluded to as an abdominal reflex at the lowest metameric level.[1] It is admitted that, unlike the abdominal reflex, this reflex depends on a simple spinal arc, and hence both these reflexes have to be considered separately from the

9. Toomey, John A.: Neutralization Experiments in Poliomyelitis: Results of Injections of Stool Emulsions in Animals Previously Passively Immunized with Convalescent Poliomyelitis Serum, J. Prev. Med. **6**:397, 1932.

10. Aycock, W. L., and Eaton, Paul: The Biseasonal Prevalence of Infantile Paralysis, Am. J. Hyg. **4**:356, 1924.

11. Kling, C.: Investigations on the Epidemiology of Poliomyelitis, Bull. Office internat. d'hyg. pub. **20**:1779, 1928.

12. Toomey, John A.: Poliomyelitis: Comparison Between Epidemic Case Peak and Harvest Peak, Am. J. Dis. Child. **46**:262 (Aug.) 1933.

13. Sicard, quoted by Rolleston; [4] Presse méd. **2**:19 (Jan. 11) 1905.

clinical standpoint. Aronovitch [6] speculated that the cremasteric reflex is older phylogenetically than the abdominal reflex, and that it would be present even in corticospinal disease. The fact that the testis sometimes contracts when the abdomen is stimulated is explained as being due to a massive flexor defense reaction in much the same fashion as Monrad-Krohn explains Riddoch's apparently contradictory findings on the abdominal skin response.[7]

Cremasteric Reaction in Normal Persons.—The reflex was always present in the normal persons whom we examined. It was present in nearly all the new-born infants. Crying or laughing does not greatly modify it.

Cremasteric Reaction in Disease.—The reflex was found to be absent after section of the cord (Riddoch). We found it to be absent in 2 cases of probable hematomyelia, in early hemiplegia during the first few days of the disease (7 of 7 cases), in a case of tumor of the testis, in 3 cases of ascites of the scrotum, in 7 cases of hydrocele and in 2 cases of hernia into the scrotal sac. We paid no attention to hyperactivity with stimulation unless we knew the condition of reflex response previous to the illness, since so many normal persons have extreme reactivity of this reflex. The reflex may have been hyperactive in 2 cases of kidney stone.

Cremasteric Reactions in Infantile Paralysis.—No matter how massive the paralysis, there was no disturbance of the cremasteric reflexes unless there was evidence of involvement of muscle nuclei from the same spinal arc segment. This was in marked contrast to the almost universal involvement of the abdominal reflex no matter what segments were later involved. Of the 376 patients examined, the reflex was absent 52 times on one side, and in these instances the involvement of muscles was usually massive and always included those muscles the nerves to which originate around the first and second lumbar vertebrae.

Comment.—The cremasteric reflex is of little value in poliomyelitis unless the segmental nerve nuclei from the first and second lumbar nerves are involved. Its importance lies in the inference one may draw from a consideration of its presence or absence in connection with the presence or absence of the abdominal skin reflex and the knee jerk.

THE KNEE JERK

The reactions to stimuli applied to the knee are well known. Like the abdominal reflex response, there were so many shades of normalcy in normal persons, some reactions approaching hyperactivity and some decreased activity, that absolute conclusions as to the existence of a pathologic state could not always be made. One could be certain, how-

ever, that there was a disturbance of the reflex response when hyperactivity nearly approached tonus, when the reflex was absent, or when there was weakness or hyperactivity on one side as compared to the other.

Reaction in Disease.—Usually there was hyperactivity in any irritative condition of the meninges, in diseases involving the upper motor neuron anywhere from the cortex to the cord, when there was abnormal sensitivity and in certain metabolic disorders. The reaction was absent in early hemiplegia, after certain injuries to the cord and in the later stages of many types of peripheral neuritis. It is not necessary to consider here the failure of a reflex response due to muscular weakness per se.

Reaction in Infantile Paralysis.—When a patient had obvious quadriceps paresis or paralysis, the knee jerk was diminished or lost. This occurred in 256 of 300 cases in which either only the muscles of the legs were paralyzed or these muscles and muscles in other parts of the body. The diminution or loss of this reflex was the usual picture when these patients were first seen for from one to seven days after symptoms had begun.

Paradoxically, in early cases with paresis of the quadriceps, there may be hyperactivity of the response followed by a lag with repeated subsequent stimuli (13 of the 54 remaining cases). Later, when somatic paralysis occurred, there was a loss of the reflex response to stimuli. In the 41 remaining cases, painful and unparalyzed muscles were associated with hyperactivity of the knee jerk on first examination. These painful muscles usually became paretic or were paralyzed within twenty-four hours after examination, and the knee jerks were lost or diminished. In another group of cases of the abortive type, there might be merely hyperactivity of the reflexes, with local pain in the muscles on the side of the hyperactivity, followed by complete cure without paralysis (10 cases). The knee jerk was often hyperactive or was hyperactive with a lag after subsequent stimulation during the early stages of the disease in patients seen outside the hospital (26 of 31 cases). This early hyperactivity of the knee reflexes has long been known, and has been especially stressed by Peabody, Draper and Dochez.[14]

Thus in patients whom we saw early and in whom paralysis later involved the quadriceps, there was at first a hyperactive reflex response of the knee jerk, occasionally with muscle weakness; after a comparatively short time, usually in a few hours, there was a diminished

14. Peabody, F. W.; Draper, G., and Dochez, A. R.: Clinical Study of Acute Poliomyelitis, New York, Rockefeller Institute for Medical Research, 1912, monograph no. 4.

response of the reflex and normal or paretic muscles. In a few more hours, there would be a diminished reflex response, with definite paresis of the muscles and, finally, only a few hours later, there would be an absence of the reflex response and paralysis of the muscles. Sometimes, of course, the poisoning was so massive that all the aforementioned reactions took place within a few hours.

Manner in Which the Knee Jerk May Become Affected.—How can one explain so many apparently conflicting and bizarre reactions, lost reflexes, hyperactive reflexes and other pathologic reactions?

If postganglionic irritation by an inflamed viscus causes a somatic peripheral irritative response, any break in the efferent arc in the area from the sixth to the twelfth thoracic nerve might lead to the opposite effect. One such effect might be a loss of the abdominal reflex by the simple abolition of the ability to transmit motor impulses. But why should the knee jerk become *hyperactive,* especially since there is no lesion of the pyramidal tract in this disease? Could it have been due to the local irritating quality of the virus in the anterior horn cell area? This would mean that edema or inflammation would have caused the loss of the abdominal reflexes by involvement of the cord about the sixth to the twelfth thoracic nerves, and that this edema or inflammation would have to spread down the cord to the third lumbar segment to involve the knee jerk arc passing by the first and second lumbar areas without affecting the simple spinal arc cremasteric reflex. This conception is illogical. Is there a better explanation? Perhaps this hyperactivity is due to irritation of the somatic nerve by the spread of the virus from the gray rami of the sympathetic to the somatic segmental nerve fiber.

Clinically, two things happened in our patients. First, there was an irritability of the reflex, and, second, a diminution or loss of the reflex. The sequence was so rapid in some cases that it was often unobserved, or at times the patient was seen too late for us to note these early changes. This train of conditions could have been brought about by any substance which first would irritate and later paralyze the lower motor arc of the somatic system.

What would be the condition if the postganglionic fibers were disconnected from the somatic system, as they probably would be if the postganglionic fibers were first involved? What would be the effect on the somatic muscles? These questions are important, since though the knee jerks are hyperactive, the muscles are weakened. Recently, Phillips [15] detailed his experiences after unilateral sympathectomy in decerebrated animals. Though decerebrate rigidity was still main-

15. Phillips, G.: On Posture and Postural Reflex Action: Effect of Unilateral Lumbar Sympathetic Chain Extirpation, Brain **54**:320, 1931.

tained on both sides, it was clear that the animals could not support the weight of the caudal end of the trunk on the hind leg of the side on which operation had been performed. Although the lengthening and shortening reactions were present constantly on both sides, the leg on the side operated on (the left side) "gave" first when there was an added increase in the flexing force by an increase in weight. Though the crossed extensor reflex was present, it was greater on the right than on the left side, and the amplitude of possible extension required to produce a minimal motor response in the opposite muscle was always less on the left side. Concerning the knee jerk, the myographic records showed that after the upward fling of the phasic response of the knee jerk, the left extensor muscle did not relax as far as the corresponding muscle in the opposite side; the left "vasto crureus" rested sooner than the right, though the reflex response was still there. The most important fact from our standpoint was that there was a weakening of the muscles coincidental with hyperactivity of the reflexes, a condition parallel to that found in the early stages of infantile paralysis. Were we to go one step further and cut the efferent roots of the spinal nerve in the same segments, there would be the condition which would later exist in poliomyelitis.

If our conception were correct and the absorbed virus or toxin caused only irritation when the gray fibers came in contact with the somatic segmental nerve, then there would not be a strictly "viscero-motor" reaction locally in the abdominal area over the involved small intestine as there is in irritative diseases of the intestine, but the pain would be referred to the areas supplied by the somatic nerves which come in contact with the gray fibers, in this case the first, second and third lumbar nerves. Instead of referred pain over the abdominal area, there is pain referred to the muscles of the thigh.

Comment.—An explanation for the early muscular weakness and diminution in the knee jerk preceding paralysis is that this effect is produced by involvement of the spinal cord via the thoracolumbar sympathetic system for the particular segment in question.[16] This seems to be a better explanation than that the decreased response is a result of "submaximal" stimulus. One is tempted to deny emphatically the primary presence of an irritating edema or inflammation to explain the reason for such a "submaximal" stimulus, especially since it is becoming the belief that the nerve cells of the anterior horn cell area are involved

16. Hunter, J. I.: The Influence of the Sympathetic Nervous System in the Genesis of the Rigidity of Striated Muscles in Spastic Paralysis, Surg., Gynec. & Obst. **39**:721, 1924.

first and that the lymphocytic inflammation occurs secondarily.[17] This opinion would controvert the theory of the existence of an edema or inflammation prior to the pathologic destruction of the cells.

Our belief in the sympathetic origin of many of the early changes in this disease was strengthened further by experiments with autonomic drugs. Pilocarpine usually caused more profuse sweating over the paralyzed side in cases of infantile paralysis. When epinephrine, a thoracolumbar specific excitor was injected into these pilocarpinized sweating patients, sweating continued over the paralyzed and ceased over the unparalyzed sides, proving at least that the thoracolumbar outflow for these segments was out of commission,[18] and that the sympathetic system was definitely involved. In addition, one could further point to the localizing fact that patients with infantile paralysis showed a definite increase in agglutination titers for the ordinary colon bacilli during the early stages of convalescence.[19]

Our conception of the march of events as regards reflex changes is as follows: The poison that causes an active case is absorbed by the gray fibers of the intestine, by the postganglionic fibers. Further spread to the preganglionated areas is impeded by the interposition of myelinated fibers, the connecting neuron. At this time the abdominal reflexes are modified. If the poison spreads it does so by way of the gray fibers toward the lumbar area, where it connects directly with the somatic nerve at a point where there are no white rami communicantes or medullated fibers. When the poison reaches the lumbar nerves, it causes an irritation, and there ensues a hyperactive reflex. Since the sympathetic influence is removed, the muscles of the quadriceps area become weakened even though the quadriceps reflexes are hyperactive. Later, the loss of the lumbar reflex coincides with segmental involvement of the anterior horn cells of the third lumbar nerve when the poison had spread toward and involved those areas, and the lancinating pains that sometimes precede paralysis could be caused by irritation of the spinal ganglion on its way to the cord. Thus the early reflex changes could be explained as the result of changes outside and not inside the spinal cord. In cases of pure polioencephalitis, however, an upper motor neuron type of lesion develops, and the loss of the abdominal reflexes is probably due to a break in the corticospinal pathway.

17. Fairbrother, R. W., and Hurst, E. W.: The Pathogenesis of, and Propagation of the Virus in, Experimental Poliomyelitis, J. Path. & Bact. **33**:17, 1930.

18. Toomey, John A.: Reactions of Patients with Infantile Paralysis to Autonomic Drugs, Am. J. Dis. Child., to be published.

19. Toomey, John A.: Increased Production of Colon Paratyphoid Agglutinins in the Blood Sera of Infantile Paralysis Patients, to be published.

CONCLUSIONS

The earliest objective signs of infantile paralysis are referable to the nervous system. In a patient seen early in the course of the disease in whom quadriceps paralysis develops later, we conceive that the following combinations occur in this order:

1. Hyperactivity of the abdominal reflex with or without hyperactivity of the knee jerk. (Note whether hyperactivity of the knee jerk is present in any instance; it could be with or without voluntary weakness of the quadriceps muscle.)

2. Lost or diminished abdominal reflexes with or without hyperactive knee jerks.

3. Lost or diminished abdominal reflexes with lost or diminished knee jerks.

4. A possible explanation for these reflex changes is given.

A PRACTICAL APPLICATION OF SOME LESSONS OF THE SELF-SELECTION OF DIET STUDY TO THE FEEDING OF CHILDREN IN HOSPITALS

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In April, 1931, a new way of serving meals to children in hospitals was instituted in the orthopedic ward of the Children's Memorial Hospital of Chicago. From the first day it pleased both children and nursing staff; it quickly won the cordial support of the dietitian and her staff, and, after a year's experience with the method in this ward, meals are now similarly served in the cardiac ward and in the ward for convalescents.

The advantages of the new serving method have been evident in:

(1) The opportunity it affords of serving a more varied diet and allowing for individual choice in foods without increase of cost.

(2) Better appetites and more enjoyment of food by the children.

(3) Lessened nursing time and labor spent in serving meals.

(4) Lessened waste of food.

The orthopedic ward is a thirty-one bed unit composed of three main rooms, with small rooms for isolation and for recovery after operation, and, during the year (April 1, 1931, to April 1, 1932) had an average daily occupancy of 27.8. Its patients are about equally divided in numbers between children having a tuberculous or other infectious disease of bone or joint, about one third of whom have fever, and well children with deformities, congenital or acquired. The patient turn-over is relatively rapid, as surgical procedures (fusion operations) have largely superseded expectant treatment or complete dependence on casts in scoliosis and in tuberculosis of the spine or joints, and also because every effort is made, compatible with the patient's best interests, to avoid long drawn-out hospitalization of the children by their early discharge to a suitable institution, if not to their own homes. Thus, an admission rate of slightly more than five per week and an average hospitalization of five and one-half weeks bracket this ward with the medical and surgical wards from the point of view of "activity," while in the course of each week more than one fifth of the children in the ward, on the average, undergo anesthesia for some surgical procedure or other. Many require more than one operation for the

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correction of their orthopedic condition and have teeth to be extracted or tonsils and adenoids to be removed. Each week, then, sees in this ward a group of children in which the newly operated on, the sick and the well, the immobilized and the ambulatory, are always present in somewhat varying but not far different proportions; and thus the conditions in this ward afford a fair test of the general applicability of the feeding method in all cases except those in which specific dietetic therapy may be indicated or solid food withheld.

Under the new plan of feeding, setting up of trays and dishing out of food in the diet kitchen, as had previously been the practice, was done away with, as was also the carrying of the trays to the children. When the food arrives from the main kitchens, it is put, in large containers, on the long cart used for carrying the children to other parts of the hospital. Pitchers of milk and of water, plates of buttered bread, stacked trays, dishes and eating utensils complete the cart's load. It is then started on its rounds through the various rooms. At first, trays, dishes and utensils were distributed from the cart before the arrival of the food, a practice soon abandoned as the children promptly discovered the possibilities of noise-making inherent in the combination of a tray and a spoon. Serving (except at supper time when student nurses do it under supervision) is done by the permanent ward personnel, i. e., the graduate nurses and ward attendants.

When the cart has been wheeled into the middle of the room, the nurse slowly and distinctly recites the menu for the meal, and each child is then served the items that he chooses, in the quantity he wishes. To the youngest ones who cannot yet talk, the nurse offers something of everything. When there is gravy, a child may have it put on his meat, bread or potatoes, as he wishes, and does not, as often happened in the routine of diet kitchen serving, have meat or potatoes ruined for him by being covered with unwanted gravy.

The children are not urged to eat, nor are they obliged to eat their food in any particular order, or to eat everything on their plates before having a second helping of something they especially like. And the cart continues on its rounds through the wards until each child has had as many helpings of the various dishes as he may wish. When a sudden run on any particular article of food occurs, this becomes apparent at once to the servers so that an additional supply can be ordered from the main kitchen in time to be delivered before actually needed. As children finish eating and opportunity occurs, their trays are carried out to the diet kitchen, but even this carrying of trays could easily be done away with by use of a double-decked cart such as is provided for the bus boy in the restaurant.

RESULTS

1. With this way of serving it has been possible to offer a wider variety of food at a meal with an amazing lessening of actual food waste and without increase in expense. Thus bananas, oranges and apples (all whole) and applesauce are on the breakfast cart. Eggs, hard-boiled in the shell, can be served three times a day, providing an alternative for the fish, meat or soup a child may not happen to care for, and, since a child touches only what is on his plate, the food remaining on the cart, if it is selected with some attention to this point and does not consist of eggs cooked out of the shell, creamed foods and other dishes good only for the meal for which they are originally prepared, is returned without harm or waste to the main kitchen and saved for future use.

2. The saving in nurses' labor in carrying of trays and going back and forth to the diet kitchen when second or even third and fourth helpings are wanted is self-evident. In a hospital where a serving list or card system is used to show quantities and food items to be served to children of different ages, postoperative patients, etc., the nurses' time used in keeping the list or card catalog up to date and in consulting the list or cards when serving would also be eliminated. The total mealtime has been shortened by fifteen to thirty minutes, and more time is available during the course of the meal for nurses to help those children who cannot feed themselves, and even, occasionally, to make pancakes or fry or scramble eggs in the diet kitchen as special treats, and a further cut in serving time and increased promptness of service could be gained in a ward of this size were two double-decked serving carts available.

3. There is lessened food waste. The question of food waste was not among the considerations that led to the introduction of this way of serving, but was promptly raised by the hospital dietitian who believed that children would ask for everything indiscriminately in large quantities and leave much uneaten, making the method extravagant. Several weeks after the plan had been put in operation, being still fearful of its wastefulness, she ordered the weighing of the edible garbage from each ward and, to the surprise of every one, found that the amount from the orthopedic ward was consistently less than from any other ward in the hospital. And this remained true throughout the year, although every effort was made by the other wards to reduce their food waste, measures that met with a considerable degree of success but did not enable them to equal the record of the orthopedic ward. The fear that children would take food that they did not want or more than they could eat proved unfounded. What they ask for is usually

eaten, and the percentage of clean plates at the end of a meal is remarkably high. In fact, this has been the chief factor in the reduction of food waste. Naturally, all wards are not fairly comparable. It seems probable that more food waste is inevitable in medical and surgical wards with more acutely ill patients, but cardiac and convalescent wards are justly comparable and, in addition, do not have a weekly list of operative cases as in the orthopedic service.

The *edible* food waste of the different wards, during the year, is given in table 1.

TABLE 1.—*Edible Food Waste from Different Wards for One Year*

Ward	Average Daily Patients per Year	Average Yearly Food Waste per Patient, Pounds
Medical	25.2	64
Surgical	28.2	91
Surgical (tonsils and adenoids) and 2 and 4 bed private rooms	15.7	86
Convalescent	21.2	53
Cardiac	33.2	82
Orthopedic	27.8	44*

* Through an error, due to vacations and shifting personnel, during six weeks of the second and third quarters, total waste (including meat bones, melon rinds, banana, orange and potato skins) was weighed for this ward, thus making the year's figures higher than if only edible waste had been weighed as was done for the other wards.

TABLE 2.—*Edible Food Waste from Different Wards for Six Months*

Ward	Average Daily Patients per Year	Average Food Waste per Patient for Six Months, Pounds
Medical	25.2	33
Surgical	28.2	49
Surgical (tonsils and adenoids) and 2 and 4 bed private rooms	15.7	50
Convalescent	21.2	24
Cardiac	33.2	42
Orthopedic	27.8	12½

For the first and fourth quarters of the year, in which only edible waste was weighed, the comparison is even more favorable. The edible waste per capita for six months for the wards is shown in table 2.

With this way of serving, the liberalization of the menu has proceeded apace. Two fresh fruits and applesauce, and both cooked and package cereal, are served at each breakfast, and a child may take any or all of these articles. The food list of the dinner has been extended to include foods that savor more of the home than of the usual "theoretical" hospital diet—hamburger steak with fried potatoes (the latter more popular when fried in butter than in lard), wieners and sauer kraut, spare ribs, pork chops, kidneys, ham sandwiches, onions, cornbread, fried mush with syrup, ice cream cones, etc. And when the cherries in the hospital yard ripened, fresh cherry pie made a treat

long to be remembered. One 4 year old child having Pott's disease ate four good sized pieces. Raw carrot cut in long thin strips are served at every dinner in addition to a cooked vegetable and are eaten in large quantities. So far as possible within budgetary limits, fresh vegetables and fresh fruits have replaced canned vegetables and canned fruits and applesauce and have proved more appetizing, some children eating three or four bananas at a meal or all three fruits for breakfast. The most noticeable result of these changes in menu from the standpoint of dietetics has been the lowering of the proportion of sweet and starchy foods and the corresponding increase in the fruits, vegetables and meats.

Children may and do make sandwiches out of their meat, or out of any other food they wish, and eat a large amount of lettuce in this way. Gelatin desserts, the hallmark of the hospital tray, have been banished—a genuine saving in kitchen time and in expense, since they afford little from a nutritional standpoint, except sugar, unless fruit is added, and experience has shown that children prefer the fruit plain, often picking it out and leaving the gelatin. Bacon is still served, but this is, in all probability, a needless extravagance for children who eagerly eat hamburger and pork chops.

In order that the fare may not lapse into the stereotyped rotation of standardized meals so characteristic of institutions, in which one always knows that on Sunday there will be chicken and ice cream for dinner, and on Tuesday, beef stew and apple pie, the dietitian visits each ward weekly and asks the children what they would like to have the next week. Usually the demands are for a repetition of some dish or meal recently served, rarely for anything strange or exotic, and the dietitian in making up next week's menus adopts such majority suggestions as are practicable and within the limits of her budget. This feature of the method has been valuable, bringing the dietitian into direct contact with the children whose meals she provides, and the staff that serves them, and she sees with her own eyes what ways of preparing foods are best liked and shares the nurses' pleasure and that of every good hostess in the enjoyment of meals shown by the children.

The question may properly be raised by the reader at this point, "What about special diets to fit different conditions or degrees of illness (operative, convalescent, etc.)?" Except for infants or children with diabetes, there are no special diets. Children who have been operated on are allowed to choose their food from the cart as do the others, as soon as vomiting has ceased, and often eat good suppers even after an operation in the morning that has lasted an hour or longer.

One condition only has required any "special" attention. Occasionally a newly admitted child, frightened, homesick, rebellious, or

perhaps a poor eater at home, does not eat well or says he does not want anything. More rarely, the same thing may occur after an operation when a child has been in terror of it, or has vomitted more than usual thereafter and apparently fears to eat for that reason. No attention is paid to such refusals to eat for a meal or two, and in the majority of cases normal eating is spontaneously resumed without further trouble. When it is not, the nurse asks the child what he would like to have and has the dietitian provide it for the next meal, if possible. This simple meeting of the child half-way, and satisfying his craving for the one thing that in his unhappy frame of mind he has set his heart on, seems to act like a trigger to his appetite and, having got that one thing, he goes on to eat the common fare without further trouble.

Psychologists have asked whether we were not "spoiling" a child by "giving up" to him in this. The answer is emphatically "no." The children have not gone on demanding special things or given any evidence of "being spoiled," and it would seem that in their sad state of homesickness, strangeness and even fright, the important thing is to have them eat and be happy—which they do.

Obviously, saving of time and labor, lessened food waste and liberalization of diet, important as they are from the institutional standpoint, are not justified at the expense of children's welfare. The final tests of a new way of serving must be: Do the children thrive as well or better? Do they enjoy their meals as much or more? Are their appetites as good?

To these questions the answer is emphatically "yes." There are no appetite problems in the orthopedic ward, where children stay for months at a time, and no poor appetites, save when grave disease makes this inevitable. Furthermore, not only are second helpings common, but many a tall, thin boy or girl has had four, five or six helpings of food and put on 10 pounds within a few weeks. There has been an entire absence of digestive disturbances—not diarrhea of any sort—while constipation has been so rare and slight as to be practically negligible.

As for the children, let them speak for themselves. There was no discussion with them of the new way of serving, nor have they been asked how they like it, but as in regard to many other things in ward life their comments have been frank. Among the first is the following brief essay, written a few days after the plan was put into operation in the orthopedic ward, when the versatile school teacher asked them to write for the children's hospital magazine on any subject they chose, and without telling her what they were going to write about.

We have lots of fun at meal time on our floor now. Dr. Davis, our new doctor, has all our food brought into the ward on a cart. We help ourselves to

what we want and as often as we want it. It is just like a party only on ice cream day we can ask for more ice cream and at parties you shouldn't do that.

For the first three days after the introduction of the new method of serving on the cardiac-nephritic ward, the children shouted "Thank you for our nice dinner" at the end of their meal, although there had been nothing new served, and the only difference was that they had what and how much they wanted.

Other children, about to be transferred to other wards or institutions, have cried and said they did not want to go "because they will make me eat my cereal"; "because I can't have all the helps I want"; "because they make you eat what's good for you," etc. No disparaging remarks from the children have yet been registered.

One criticism, by some of their elders, has been made of this way of serving, viz., that "the children show such awful manners" and that meals are noisier, with children shouting their eager answers when asked what they will have and lapsing into such inelegant expressions as "Give me some of that!" "Gee, I want some more potatoes!" etc., the crudeness being accentuated by unmodulated voices and sometimes by competition.

This criticsm is admittedly based on actual fact. Such manners and such language are not unknown in the ward and, I believe, are not wholly lacking at the mealtimes of hungry children within the sanctuary of the home. The acquiring of polite manners that "hold" in the presence of hunger and its discomfort is at best a laborious process and one that with the constant admission of new patients and the multifarious demands on nursing time is difficult to cope with. Many of the children have had but slight advantage of precept and example in their own homes and have shed this at the hospital door with home clothing and family life. Careful observation, however, would seem to indicate that the superiority in manners of children served in the usual way is more negative than positive in character. The child's manners and speech are presumably the same whether he receives a tray in amiable silence, knowing "that's that" and there is nothing he can do about it, or voices his wishes and preferences in the vernacular of his ordinary life.

The child kept by his disabilities for weary months in the hospital unfortunately cannot escape "institutionalization" to some degree. Life within these walls is, and as far as we can see, must be, more or less stereotyped and humdrum. "Nor sights, nor sounds, nor smells, nor tastes" are "homely" to our little patients. One small girl of 10 who had been for five years in institutions and hospitals said in almost tearful joy at her first pancakes, "Why, I haven't had a pancake in years, not since I was a little girl at home!"

Tenderly and efficiently cared for as they are, it is a regimented life they lead in which down to the smallest things, "alles ist geordnet, und vieles verboten [every thing is regulated, and much is forbidden]." It may matter little to an adult what fruit he has for breakfast, whether the gravy is put on his potatoes or his meat or his plate piled with food he does not like. Eating, for him, has ceased to be his greatest pleasure. But the joys of food bulk large in childhood, and if we can add to the gusto with which the child eats, allow him some liberty of choice and at the same time have him thrive to a greater degree, it would seem to be worth while, whether by this or any other way of serving meals.

DISCUSSION

DR. JESSE R. GERSTLEY: Do children divide into groups in regard to preference for any particular type of food? It has been my experience in private practice that some children prefer sweets, starches and milk, while others prefer food high in protein such as meats and eggs. In private practice, of course, we cannot follow our patients and study their diet as carefully as has Dr. Davis.

Has Dr. Davis noted such a division, and if so, does any particular physical type of child show a preference for any special type of diet?

DR. ROBERT E. BLESSING: I should like to know if these children have any "food jags."

DR. CLIFFORD G. GRULEE: Has Dr. Davis any knowledge of what these children do when they get home? I imagine their parents do not push a cart filled with food around for them.

DR. C. A. ALDRICH: I should like to know how much milk these children drink each day.

DR. CLARA M. DAVIS: I have not observed that the children are divided into groups in respect to their eating habits. I think there may be differences in appetite between the children in the hospital and those at home. Hospitalized children are confined to bed for the greater part of their stay, and presumably the demand for energy-producing food is not as great as when they are in the home.

I have not known any child to refuse ice cream, but I think other sweets are not particularly desired, and the nurses find that it is hardly worth while to serve sweet desserts for children, such as custards, jellos and puddings. The protein foods and the fruits, with such vegetables as beets, carrots, lettuce and potatoes, are the favored foods. I have seen a child make an entire meal of beets. These children have "food jags" to a certain extent. We have had a typical "egg jag," with a child eating from five to eight eggs a day for several days.

I do not know what these children eat when they get home. Judging from the history of the dispensary patients, I think they have far less fruit, vegetables and meat and more jelly, bread, cookies and sweet things than they get in this ward. There is no set rule as to the drinking of milk, some children drinking much, others little. Following an operation and during convalescence children seem to want large amounts of meat, especially hamburger steak.

DIET OF TUBERCULOUS AND NONTUBERCULOUS CHILDREN

EFFECT OF INCREASED SUPPLY OF VITAMIN B CONCENTRATE AND MINERALS

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In a previous experiment [1] we demonstrated that the addition of vitamin B and of mineral elements increased the gain in weight of children with tuberculosis. These elements were fed daily in the form of a cereal (Brown, Drake and Tisdall [2]), the content of which was as follows: wheat meal, 53 per cent; oatmeal, 18 per cent; cornmeal, 10 per cent; wheat germ, 15 per cent; bonemeal, 2 per cent; dry brewers' yeast, 1 per cent; alfalfa, 1 per cent; calcium, 0.78 per cent; phosphorus, 0.62 per cent; iron, 0.024 per cent; copper, 0.0013 per cent, and vitamins A, B, E and G.

In the experiment reported in this paper we proposed to find out what parts of this special cereal effected the gain in weight in the previous experiment [1] and to ascertain what effect the added minerals had on the gain in weight and on the hemoglobin of the blood.

MATERIAL AND METHOD

Experimental Groups.—The ages of the children used in this study ranged between 3 and 17 years. The diagnosis for all was either latent tuberculosis or suspected tuberculosis. After admission to the hospital all the children were placed on the regular hospital diet, and the same diet was continued throughout the ten weeks of study, except that minerals,[2a] the vitamin B complex concentrate [2a] or the special cereal [2a] was added to the hospital diet. The entire group of forty children received the same dietary content for the first three weeks. During this time they all received six tablespoonfuls of farina daily, which is chiefly carbohydrate. None of the children received viosterol or cod liver oil throughout the entire experiment. All were exposed to the sun for one hour a day. After the three weeks of control, the forty children were divided into four groups of ten each. These subgroups were equally divided according to age, gain in weight and per

From the Boehne Tuberculosis Hospital.

1. Crimm, P. D.: J. Indiana M. A. **25**:205, 1932.

2. Tisdall, F. F.; Drake, T. G. H., and Brown, Alan: A New Cereal Mixture Containing Vitamins and Mineral Elements, Am. J. Dis. Child. **40**:791 (Oct.) 1930.

2a. Supplied by Mead Johnson & Co.

cent of hemoglobin. After this selection was made, one group served as a control, one group had minerals added to the farina, one group had the vitamin B complex concentrate added and another group was fed the special cereal containing both minerals and vitamins. The special cereal, which was the same as that used in the previous experiment,[1] replaced the farina given to the other three groups. In order to avoid any choice in selection, the groups to take the respective dietary additions were chosen by ballot; however, after the experiment, the numbers of the groups were changed to consecutive ones to avoid confusion in this report. Group 1, therefore, was the control; group 2 received two capsules of mineral mixture a day (table 1 gives the analysis of this mineral mixture as compared to the mineral mixture content of the special cereal); group 3 received the same quantity of vitamin B complex concentrate which those in the group receiving special cereal received; group 4 received four tablespoonfuls of the special cereal in place of the farina given group 1, the farina and two capsules of minerals given group 2 and the farina and vitamin B complex concentrate given group 3. The caloric intake of all four groups was essentially the same. All of the children were weighed weekly. Individual variations did not invalidate the group averages.

TABLE 1.—*Mineral Content of the Diets in the Mineral and in the Special Cereal Groups*

Minerals	Two Capsules of "Mineral Mix" Contain, Gm.	Four Tablespoonfuls of Cereal Cooked Contain, Gm.
Ca	0.11	0.12
Mg	0.02	0.02
K	0.18	0.06
Na	0.07	0.07
P	0.07	0.09
Fe	0.004	0.004
Cu	0.0001	0.002
Cl	0.08	0.10
S	0.02	0.002

Method.—Determinations of hemoglobin were made weekly by the Newcomer[3] method. Determinations of calcium and phosphorus were made during the three week control period and during the last week of the experiment. Calcium was determined according to the Clark and Collip[4] method (modification of Kramer and Tisdall[5]). Determinations of phosphorus were made according to the method of Benedict and Theis.[6]

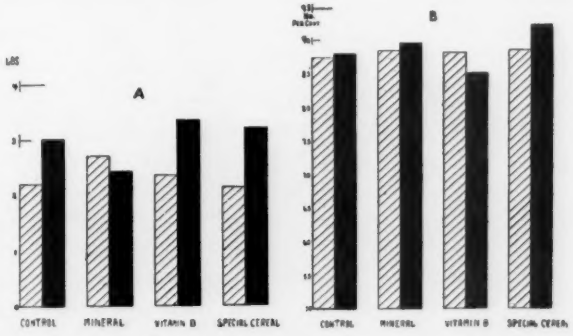
RESULTS ON WEIGHT

As stated before, not only did this experiment have a control period of three weeks in all groups, but the three test groups had a control in group 1. At the end of the seven week test period control group 1 showed an average gain of 3.02 pounds (1.5 Kg.), or a net gain of 0.82 pounds (0.4 Kg.) (table 2). The mineral mixture group had an average gain of 2.43 pounds (1.1 Kg.), which was a net loss of 0.27 pounds

3. Newcomer, H. S.: J. Biol. Chem. **37**:465, 1919.
4. Clark, E. P., and Collip, J. B.: J. Biol. Chem. **43**:461, 1925.
5. Kramer, B., and Tisdall, F. F.: Bull. Johns Hopkins Hosp. **32**:44, 1921.
6. Benedict and Theis: Bull. Johns Hopkins Hosp. **61**:63, 1924.

(0.14 Kg.). The vitamin B complex group made an average gain of 3.36 pounds (1.58 Kg.), a net gain of 1 pound (0.5 Kg.). The special cereal group made a gain of 3.22 pounds (1.51 Kg.), a net gain of 1.07 pounds (0.53 Kg.).

The gain in weight of the control group and of each test group during the first three weeks of the entire ten weeks is attributable entirely to the effects of an adequate diet and the routine of hospitalization. The added increase in weight of the group fed the vitamin B complex concentrate and of the special cereal group is attributable to the added vitamin B content of the diet which the control group did not receive. Rosenberg [7] emphasized the importance of the vitamin B complex in increasing the weight of children. Morgan and Barry [8] attributed the striking gain in weight in children to the vitamin B furnished by means of wheat germ and yeast. In the light of our previous work,[1] if the period of feeding had been doubled the net gain in weight of the group



A, chart showing average gain in weight. *B*, chart showing average gain in hemoglobin. The solid black columns represent the test period; those with diagonal lines, the control period.

fed the special cereal, and presumably also that of the group given the vitamin B complex, would have been more marked. The group fed the mineral mixture lost weight. (Chart *A* shows the percentage of gain or loss in weight in the different groups.)

RESULTS ON HEMOGLOBIN

The classification of the four groups according to the increase in the percentage of hemoglobin presents a different picture than the classification according to weight. The control group had an increase of

7. Rosenberg, L. C.: Malnutrition in Children: Attempt at Standardization of Dietary, Am. J. Dis. Child. **41**:303 (Feb.) 1931.

8. Morgan, A. F., and Barry, M. M.: Underweight Children: Increased Growth Secured Through Use of Wheat Germ, Am. J. Dis. Child. **39**:935 (May) 1930.

0.6 per cent in hemoglobin, while the vitamin B complex group showed a loss of 3.07 per cent. The mineral mixture group showed a net increase of 1.13 per cent, while the special cereal group gained 3.88 per cent of hemoglobin. (Chart *B* shows the per cent of gain or loss of hemoglobin of the respective groups.) The greater increase in hemoglobin of the mineral and special cereal groups than of the control group was evidently due to the added mineral content. The loss of hemoglobin in the vitamin B complex group, while the control group gained, is not explainable at present. Summerfeldt [9] found a greater gain in hemoglobin than we did, probably due to the fact that her initial hemoglobin values were lower than ours. She attributes the increase in hemoglobin to the high iron content of the special cereal

TABLE 2.—*Average Weight, Hemoglobin, Calcium and Phosphorus in Various Groups*

Determinations		Groups			
		Control	Mineral Mixture	Vitamin B Complex	Special Cereal
Weight gain..... (Pounds)	Control period.....	2.2	2.7	2.36	2.15
	Test period.....	3.02	2.43	3.36	3.22
	Net gain.....	0.82	0.0	1.00	1.07
	Net loss.....	0.0	0.27	0.0	0.0
Hemoglobin..... (Per cent)	Control period.....	87.55	88.62	88.39	88.64
	Test period.....	88.15	89.75	85.32	92.52
	Net gain.....	0.6	1.13	0.0	3.88
	Net loss.....	0.0	0.0	3.07	0.0
Blood calcium..... (Mg. per 100 cc.)	Control period.....	11.3	10.9	10.5	11.3
	Test period.....	11.5	11.6	11.5	12.7
	Net gain.....	0.2	0.7	1.0	1.4
	Net loss.....	0.0	0.0	0.0	0.0
Blood phosphorus (Mg. per 100 cc.)	Control period.....	4.7	4.7	4.6	4.4
	Test period.....	4.8	5.4	5.2	4.8
	Net gain.....	0.1	0.7	0.6	0.4
	Net loss.....	0.0	0.0	0.0	0.0

mixture. We have verified her conclusion. However, since the group fed the special cereal showed such a marked gain in hemoglobin over the control group and the mineral group, added vitamins A and E in the former group may be responsible for the more marked elevation of hemoglobin. Such an assumption seems reasonable in view of Werkman's [10] results with rats.

RESULTS ON CALCIUM AND PHOSPHORUS

The calcium and phosphorus contents in all four groups were within normal concentrations, during both the control and the test periods. This further corroborates our contention that there is a direct proportion between the intake of calcium and phosphorus in the diet and

9. Summerfeldt, Pearl: Value of Increased Supply of Vitamin B_1 and Iron in Diet of Children, Am. J. Dis. Child. **43**:284 (Feb.) 1932.

10. Werkman, C. H.: J. Infect. Dis. **32**:255, 1923.

their concentration in the blood stream in persons without calcium deficiency diseases.[11] The four groups had essentially the same initial calcium and phosphorus concentrations in the serum. The special cereal group showed a markedly greater net gain in the calcium concentration in the blood than the control group. The net gain in the former group may be attributed to the fact that the minerals were in a form in which they are more easily assimilated. The serum phosphorus rose to a higher level in the mineral, vitamin B complex and special cereal groups than in the control group. The differences in calcium and phosphorus concentrations are shown in table 2.

COMMENT

During the experiment the children showed no difference as to appetite in any of the groups, which may be accounted for by the fact that the diet of all groups contained vitamin B. Groups 3 and 4, of course, received an addition of vitamin B complex. Hoobler,[12] Dennett,[13] Bartlett[14] and others have suggested that a lack of this vitamin may be an important factor in anorexia in certain infants. The fact that the group fed the vitamin B complex concentrate lost in hemoglobin, while in the control group hemoglobin was slightly increased, may or may not prove to be significant. As yet we do not know whether a proper balance of vitamins and minerals is necessary to increase hemoglobin. On the other hand, the special cereal group, which received minerals, vitamin B complex, and vitamins A and E, gained markedly in hemoglobin. It is apparent that vitamins A and E have some influence on the hemoglobin of the red blood cell. The mineral mixture group lost weight compared to the control group. Whether this was a coincidence or whether the minerals administered alone prevented the proper balance for assimilation and gain in weight, we do not know.

SUMMARY

Forty tuberculous and nontuberculous children of approximately normal weight, ranging in age from 3 to 17 years, were divided into four groups, which were designated as the control, mineral mixture, vitamin B and special cereal groups.

The daily administration of a special cereal mixture composed of farina 53 per cent, oatmeal 18 per cent, cornmeal 10 per cent, wheat

11. Crimm, P. D.: Am. Rev. Tuberc. **25**:112, 1932.

12. Hoobler, B. R.: Symptomatology of Vitamin B Deficiency in Infants, J. A. M. A. **91**:307 (Aug. 4) 1928.

13. Dennett, R. H.: Routine Use of Vitamin B Factor in Infant Feeding, J. A. M. A. **92**:769 (March 9) 1929.

14. Bartlett, W. M.: Analysis of Anorexia, Am. J. Dis. Child. **35**:26 (Jan.) 1928.

germ 15 per cent, bonemeal 2 per cent, dried brewers' yeast 1 per cent and alfalfa leaf meal 1 per cent, which supplied in liberal amounts calcium, phosphorus, iron, copper and vitamins A, B, E and G in the diet of the group fed this mixture, was accompanied by an increase in weight and in hemoglobin over the controls.

The serum calcium rose to the highest concentration in the group fed the special cereal. The serum calcium and phosphorus rose to higher concentrations in the groups fed the mineral mixture, the vitamin B complex concentrate and the special cereal than in the control group.

The data suggest that the vitamin B content of the special cereal was largely responsible for the increased gain in weight.

The mineral content of the special cereal was apparently responsible for the increase in hemoglobin.

The addition of vitamin B concentrate or of minerals to a regular diet does not seem to be as satisfactory as the feeding of a combination of the two in the form of a special cereal, which contains in addition vitamins A and E.

VEGETABLE FEEDING IN THE YOUNG INFANT

INFLUENCE ON GASTRO-INTESTINAL MOTILITY AND MINERAL RETENTION

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AND
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The addition of semisolid food, particularly in the form of cereal and vegetable, to the dietary of the young infant is now commonly and widely practiced. Some pediatricians advocate such additional feedings at very early ages of infancy. Such practice is probably in direct response to increased knowledge of the importance of accessory food factors and mineral constituents in the dietary of the growing organism. It is known that these constituents are widely represented in the vegetable kingdom and will supposedly supply these needed substances to the growing organism, provided it can digest and assimilate them.

Clinically, it seems possible to feed them to the infant without any apparent harm. In fact, quite to the contrary, the feeding of such additions in reasonable amount seems to influence growth and development most favorably. Just how this was brought about was, until recently, a problem quite unsolved, since comparatively little scientific investigation had been carried out in this field.

One of the conceptions, empirically quite firmly established, was to the effect that the feeding of vegetables furnished an abundance of essential mineral substances in suitable and usable form to the growing organism. It was believed that the favorable effect observed when properly prepared vegetables are added to milk feedings was due to the addition of salts, notably iron, lacking in milk or inadequate for the growing organism if milk is used as the sole nutriment.

The theory was also advanced that vegetables were useful in neutralizing high acid metabolism products by virtue of alkalis that they contained. Some investigators believed that the influence of vegetable feeding on motility, digestive activity and increased enzyme function was a partial explanation of the observed favorable effects. Others again ascribed it entirely to the effect of vitamins, substances in which some vegetables are supposedly very rich.

From the Department of Pediatrics, University of Chicago.
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Read at the meeting of the American Pediatric Society, June, 1932.

There is a prevailing opinion that fresh and even raw vegetables are far superior as a source of vitamin in the dietary than are canned or cooked vegetables. Most of these conceptions and contentions individually have some merit, but collectively have been wanting considerably in adequate scientific proof.

The published data have, until recently at least, been meager, often contradictory and quite inconclusive. They concern chiefly the elements calcium, phosphorus, iron and nitrogen. In some early metabolism experiments, Courtney, Fales and Bartlett [1] were able to show that the addition of vegetable matter (spinach) to the diet of a rachitic child caused improved mineral balances. Further studies were promised, but have never been published.

Freise and Rupprecht [2] found positive calcium balances, especially in rachitic children, after feeding vegetable juices. They found this particularly true of raw vegetable juice as compared with heated vegetable juices. The phosphorus balance was uninfluenced or tended to be negative.

While Rose,[3] Blatherwick and Long [4] and McLaughlin [5] found positive calcium balances in adults with vegetable feeding, especially with spinach, Sherman and Hawley [6] were not able to show this for the child. Calcium and phosphorus retentions after vegetable additions (carrots and spinach) to the diet were in no case as good as those observed with milk feeding alone. Similar results were observed in young growing dogs by McCluggage and Mendel.[7]

The amount of roughage in the diet is a big factor in the retention of calcium and phosphorus. Sjollema [8] has shown that an increase of indigestible crude fiber in the diet causes a higher output of calcium in the feces. Bloom [9] reported similar findings, and observed no difference between raw and cooked spinach with reference to this effect.

Whitacre, Willard and Blunt [10] found that a high proportion of bulk in the diet tended to reduce the utilization of nitrogen to a low plane and caused negative retention. Similar results, particularly for calcium,

1. Courtney, A. M.; Fales, H. L., and Bartlett, F. H.: Some Analyses of Vegetables Showing the Effect of the Method of Cooking, Am. J. Dis. Child. **14**:34 (July) 1917.
2. Freise, E., and Rupprecht, P.: Monatschr. f. Kinderh. **19**:115, 1921.
3. Rose, M.: J. Biol. Chem. **41**:349, 1920.
4. Blatherwick, N., and Long, M. L.: J. Biol. Chem. **52**:125, 1922.
5. McLaughlin, L.: J. Biol. Chem. **74**:455, 1927.
6. Sherman, H., and Hawley, E.: J. Biol. Chem. **49**:21, 1920.
7. McCluggage, H., and Mendel, L.: J. Biol. Chem. **35**:353, 1918.
8. Sjollema, B.: J. Biol. Chem. **57**:271, 1923.
9. Bloom, M.: J. Biol. Chem. **89**:221, 1930.
10. Whitacre, J.; Willard, A., and Blunt, K.: J. Nutrition **2**:187, 1929.

were observed in the experimental animal by Aschem,[11] Hart, Steenbock and co-workers[12] and Givens and Mendel.[13]

The data on iron are contained largely in the excellent publications of Robscheit-Robbins and Whipple. Leichsenring and Flor[14] determined the iron requirement of the preschool child, but did not specifically study the effect of vegetable additions to the diet on iron retention. A similar study by Rose and a group of workers[15] shows the total iron requirement in early childhood. A negative iron balance after vegetable feeding was found in a child of 2½ years.

Robscheit-Robbins and Whipple[16] found that, on the whole, vegetables are fairly uniform in their effect on anemic dogs and possess but a modest amount of substances which are favorable for new hemoglobin production. The chlorophyll content of the vegetables seemed to be in no way related to this reaction. The vegetables particularly studied were spinach and cabbage.

The animal experiments of Elvehjem, Herrin and Hart[17] and of Hart and co-workers[18] seemed to indicate that the addition of fresh green vegetables to the dietary did not increase the iron retention.

Working independently of us on a somewhat similar problem, and after the completion of our results, Langer[19] published some comprehensive data on the effect of vegetable matter on gastro-intestinal motility, and E. Edelstein[20] gave some extensive data on the effect of vegetable additions to the diet on the nitrogen and mineral metabolism of the child.

Langer[19] found the secretion of gastric juice diminished during the period of vegetable feeding as compared with the vegetable-free period. The emptying time of the stomach varied considerably with different vegetables. It was quite delayed for spinach. The crude fiber content seems to be a factor in this delay. The carbohydrate content, the age of the vegetable, its mode of preparation and the volume given influence

11. Aschem, L.: J. Nutrition **3**:411, 1930.

12. Hart, E., and Steenbock, H.: J. Biol. Chem. **14**:75, 1913. Steenbock, H., and Hoppert, C. A.: J. Biol. Chem. **48**:33, 1921. Hart, E.; Steenbock, H.; Kletzien, S., and Scott, H.: J. Biol. Chem. **71**:271, 1927.

13. Givens, M., and Mendel, L.: J. Biol. Chem. **31**:421, 1917.

14. Leichsenring, J., and Flor, I.: J. Nutrition **5**:141, 1932.

15. Rose, M.; McVahlteich, E.; Robb, E., and Bloomfield, E. M.: J. Nutrition **3**:229, 1930.

16. Robscheit-Robbins, F., and Whipple, G.: Am. J. Physiol. **92**:400, 1930.

17. Elvehjem, C.; Herrin, R., and Hart, E.: J. Biol. Chem. **71**:255, 1927.

18. Hart, E.; Steenbock, H.; Elvehjem, C., and Waddell, J.: J. Biol. Chem. **65**:67, 1925.

19. Langer, H.: Ztschr. f. Kinderh. **52**:465, 1931-1932.

20. Edelstein, E.: Ztschr. f. Kinderh. **52**:483, 1932.

the emptying time. Canned vegetables leave the stomach more quickly than raw or fresh cooked vegetables.

Edelstein [20] and Edelstein, Langer and Langstein,[21] in their study of the influence of the addition of vegetables on the nitrogen and mineral metabolism of the child, reported the results of five experiments in which spinach and carrots were added to the milk diet. They found regularly a diminution of the retention of nitrogen, calcium and phosphorus. A relative and absolute decrease of the balance followed, whether a diminished or an increased amount of nitrogen and salt mixture was given. The authors believe that the diminution of the retention is probably best explained on the basis of an inefficient utilization of these substances. Experiments with fresh and canned vegetables showed no difference with respect to retention.

There are practically no experimental data available with reference to crude fiber or vegetable feeding and mineral balances of other substances than the ones already mentioned.

The primary object of our experiments was to determine the digestibility of vegetable matter for the very young infant, to observe its effect on gastro-intestinal motility and to determine particularly the effect of such feeding on the mineral metabolism.

Our investigation to date has been limited to a study of the effects of spinach, a vegetable often included in the diet of infants and selected here because of its comparatively high mineral content. Three forms of spinach have been used in the experiments: dried, powdered spinach, canned puréed spinach and raw spinach. The dried spinach [22] was used first, since it could be easily obtained in uniform lots in quantities sufficient for the duration of the experiment and could be fed quantitatively by mixing with the milk formula. Canned puréed spinach, however, represented a form which has greater access to the household and one which more closely resembles the spinach which is ordinarily fed to the infant. It was considered necessary, therefore, to test the effect of this form of spinach as well, since it was conceivable that a different effect on the mineral metabolism might be produced because of the different consistency of the spinach. Since there is a growing tendency toward the use of raw vegetables in infant feeding, we wished also to include raw spinach in our study.

Aside from their vitamins, vegetables are considered beneficial chiefly because of their fiber and mineral content. If spinach were

21. Edelstein, E.; Langer, H., and Langstein, L.: Deutsche med. Wchnschr. **57**:839, 1931.

22. The dried spinach for the experiments was provided through the courtesy of Dr. William Weston and Dr. Roe E. Remington of the South Carolina Food Research Commission.

found to have any influence on mineral metabolism, it seemed conceivable that such an effect might be due to the simple increase of the mineral content of the diet or to the addition to it of a certain amount of indigestible connective fiber which might, in turn, increase the fecal output. To check these factors, our study includes some periods in which Cellu-flour,[23] a powdered form of cellulose practically free from mineral salts, supplemented the milk diet and others in which an arti-

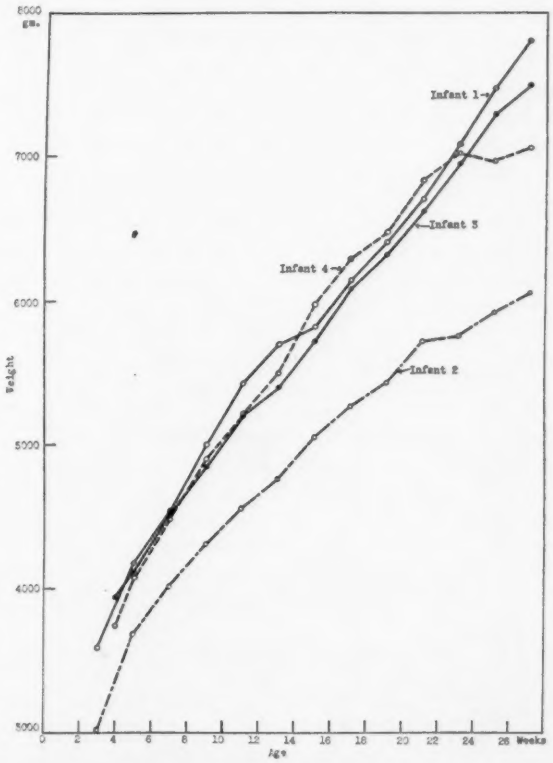

Chart 1.—Growth curves showing gains in weight of the four infants during the course of the experiments.

ficial salt mixture approximating the salt content of the spinach was added to the milk formula.

Four normal, healthy infants have been studied whose ages ranged, during the course of the experiments, from 5 weeks to 6 months. During this time they grew normally, as shown in chart 1. The effects of Cellu-flour and the artificial salt mixture were observed on each of these infants. Three of the infants received dried spinach, three puréed

23. Obtained from the Chicago Dietetic Supply House.

spinach and one raw spinach. In all, four series of experiments have been conducted to determine the effect of dried spinach, five series for puréed spinach, one for raw spinach and five each for Cellu-flour and mineral salts.

PLAN OF RESEARCH AND METHODS USED

For any given supplement, spinach, Cellu-flour or the salt mixture, our plan provided a series of three metabolism periods. The first was a control period in which the infant received the milk formula only. It was a six day period, during which the infant was kept on the metabolism bed and all excreta were collected. It did not begin until the infant had been receiving the given diet at least five days previously and had adjusted itself to that diet. During the second and third periods the infant received spinach or another supplement in addition to the milk formula of the preceding period. In the first of these periods we aimed to determine the immediate effect of the spinach. It followed twenty-four hours after the spinach was added to the milk formula, this time being allowed for the spinach to traverse the intestinal tract. This period lasted only three days. The second of the spinach periods was designed to determine the effect after the infant's system had reached equilibrium with regard to the spinach. It began after the infant had been receiving the spinach six days, and lasted six days. Usually, for a given infant, these series of three periods followed one another without interruption. In a few cases the metabolism was interrupted because of intestinal upset and diarrhea and was resumed after the infant had entirely returned to a normal condition. For infants 1 and 2 it was also interrupted toward the end because of hot weather and excessive perspiration. At the outset, two periods on the milk formula alone were used for three of the infants instead of the customary one period.

The milk formula contained powdered milk, cane sugar and distilled water. A 25 pound (11.3 Kg.) can of the powdered milk was kept on hand for each infant, enough for the duration of the metabolism periods. This insured a uniform intake of minerals from the milk. The concentration of the milk in the formula and its volume were increased as the infant grew, but this increase was always made at the beginning of the control period of each series, and five days were allowed for the system to reach equilibrium.

The supply of each of the three forms of spinach was also practically uniform for a given series of experiments. Although the puréed and raw forms of spinach were packed in small lacquered tin cans containing from 160 to 170 Gm., all the spinach for a series came from the same factory batch, and an effort had been made to have the contents of all the cans as uniform as possible.[24] Samples from several cans were analyzed and found to agree well with each other and with a composite lot made from 30 Gm. samples from each can opened during one series of experiments. To insure its being consumed quantitatively, all of the spinach given the infant was thoroughly mixed with the milk formula and fed through a nipple. The daily allowance of puréed spinach was 60 Gm., an amount which was considered reasonable for a small infant to consume but which, as the table shows, proved to contain very little of some of the mineral elements, notably

24. Dr. G. A. Fisher of the Van Camp Packing Company, Indiana, supplied us with puréed and raw spinach. The raw spinach was finely ground and uniformly mixed, sealed into lacquered tin cans in an atmosphere of carbon dioxide, mailed in a carton containing carbon dioxide snow and subsequently kept in a refrigerator. It showed no evidence of spoiling at the end of the metabolism period of two weeks.

calcium and phosphorus, when compared with the daily intake from the milk. The large sodium and chlorine contents of the puréed spinach were due to sodium chloride which had been added at the factory to improve its taste. The daily allowance of dried spinach was 6 Gm. and that of raw spinach 70 Gm., amounts which corresponded fairly closely in nitrogen content to that of the 60 Gm. of puréed spinach. The amount of Cellu-flour given greatly exaggerated the fiber content of the spinach: 6 Gm. daily for all except infant 3 who received 9 Gm.

In most cases the milk formula and the rinsings from the bottle were entirely consumed. This was true for all of the spinach periods. In the few instances when it was not the case the milk and rinsings were combined for the period, an aliquot was analyzed for nitrogen, and from this the amount of milk powder not consumed was calculated and subtracted from the intake. As a rule, the amount of regurgitation of food was small. Periods in which it was excessive were discarded. The amount of milk lost by regurgitation was approximated by calculating from the gain in weight of the gauze on which the regurgitations were collected.

Percentage Increase in the Various Mineral Elements of the Diet Due to Spinach

Form of Spinach	Infant	Period in Which Spinach Supplemented Diet	Nitrogen	Sodium	Potassium	Calcium	Magnesium	Iron	Chlorine	Phosphorus	Sulphur
Dried.....	1	8-9-11-12	10.6	27.0	36.0	10.1	71.6	.....	5.2	6.0	22.6
(N. Carolina)	3	6-7	8.6	20.5	32.6	8.2	62.2	446.0	3.4	5.6	19.1
	4	6-7	9.8	23.6	37.4	9.4	68.6	475.5	3.9	6.4	20.9
Puréed.....	2	6-7	10.9	103.0	17.1	13.7	57.1	.....	61.8	5.9	16.4
(Indiana)	3	9-10	7.2	71.3	14.6	9.2	38.4	139.2	40.4	4.2	11.2
		12-13	8.5	85.4	9.2	12.2	43.8	117.7	47.5	3.1	12.5
	4	9-10	8.1	81.6	16.6	10.3	41.8	146.6	45.6	4.7	12.1
		12-13	9.6	97.5	10.4	13.8	48.0	124.0	53.9	3.5	13.5
Raw (Indiana)	2	9-10	8.8	7.8	38.7	7.6	98.6	.....	2.9	3.9	15.5

Analyses were made for total nitrogen, sodium, potassium, calcium, magnesium, iron, chlorine, total phosphorus and total sulphur. Nitrogen was determined by the Kjeldahl method, sodium by the method of Barber and Kolthoff,[25] potassium by the method of Fiske and Litarczek,[26] calcium by the method of Fiske and Adams,[27] chlorine by the method of Laudet,[28] phosphorus by the method of Fiske and Subbarow,[29] and sulphur by the Benedict-Denis[30] method. Magnesium was determined by a modification of an unpublished method of Fiske described by Swanson.[31] Iron was determined by an adaptation of the method of Stugart.[32] The method was checked against Sheet's modification of Kennedy's[33] method with agreeing results for both spinach and feces. The iron of the urine was not deter-

25. Barber, H. H., and Kolthoff, I. M.: J. Am. Chem. Soc. **50**:1625, 1928.

26. Fiske, C. H., and Litarczek, G.: J. Biol. Chem. **67**:xvi, 1926.

27. Fiske, C. H., and Adams, E. T.: J. Am. Chem. Soc. **53**:2498, 1931.

28. Laudet, M. M.: J. de pharm. et chim. **16**:168, 1917.

29. Fiske, C. H., and Subbarow, Y.: J. Biol. Chem. **66**:375, 1925.

30. Denis, W.: J. Biol. Chem. **8**:401, 1910.

31. Swanson, W. W.: The Composition of Growth, Am. J. Dis. Child. **43**:10 (Jan.) 1932.

32. Stugart, R.: Indust. & Engin. Chem. (Anal. Ed.) **3**:392, 1931.

33. Kennedy, R. P.: J. Biol. Chem. **74**:385, 1927.

mined, since it was believed that the amount excreted through that channel was too small to affect the retention appreciably. For analyses of sodium, potassium, calcium, magnesium, phosphorus and iron, dry ashings of the materials were made in a muffle furnace with temperature control at 400 C., and the ashings dissolved in normal hydrochloric acid. Usually it was necessary to filter off some unashed material and re-ash, combining this solution with the first portion. Individual ashings were made for the iron determination, using special precautions to avoid a rapid combustion and requiring 1 cc. of concentrated hydrochloric acid and often a sodium carbonate fusion for final solution of the ash. Analyses for nitrogen, chlorine and sulphur were made directly on the material after decomposing the organic matter in a special manner for each case.

RESULTS

The results are represented graphically in charts 2 to 10, in which, for each mineral element and nitrogen and for each infant, the total intake, output in urine, output in the feces and the balance or retention for a given period are plotted against the number of the period as it occurred chronologically. Quantities are expressed in terms of millimols. In interpreting the charts it must be remembered that the actual values of intake, output or retention are represented by the plotted points and that the lines connecting them are valueless except as a means of directing the eye toward a change. Those periods in which the infant received a supplement, spinach, Cellu-flour, etc., are marked off by vertical bars with Roman numerals to indicate the nature of the supplement. The two periods in each case represent the immediate and the equilibrium effect of the spinach. A study of the results showed little influence, if any, of the spinach, Cellu-flour or mineral salts on the mineral retention of the infant. At the same time there were many variations in the different infants or even in the same infant in repeating the experiment. We have not, therefore, felt justified in expressing our results in averages, but are drawing conclusions from general trends as shown by the charts. Each element will be considered in turn.

Nitrogen.—In general, nitrogen retentions (chart 2) were fairly uniform throughout the experimental period, apparently independent of the intake and unaffected by the addition of spinach or Cellu-flour to the diet. In four of five instances, puréed spinach (chart 2, *III*) caused an immediate small increase in nitrogen retention, owing to a decreased output in the urine, but after a few days on the diet the infant apparently adjusted itself to the increased intake and its retention returned to normal. Raw spinach (*IV*) in the one instance studied produced a decreased output in the urine which was largely compensated for by an increased output in the feces. The effects of dried spinach (*II*) were small and inconsistent with each other. In general there was a slightly increased output of nitrogen in the feces in the

periods on dried spinach which corresponded to an increase in the total output of feces (see the weight of dried feces, chart 5), but since these increases were small and the output in the feces small compared with the output in the urine, their effects on the nitrogen retention were insignificant. The results of the Cellu-flour periods (*I*) seem to show that this small increase in the output of nitrogen in the feces was due to the nonutilization of a small portion of the spinach nitrogen rather than to increased intestinal bulk. The amounts of Cellu-flour given greatly exaggerated the increase in bulk due to the spinach, and yet in only two of ten cases was there evidence of an increase in fecal nitrogen. Most of the nitrogen of the spinach, no matter what the

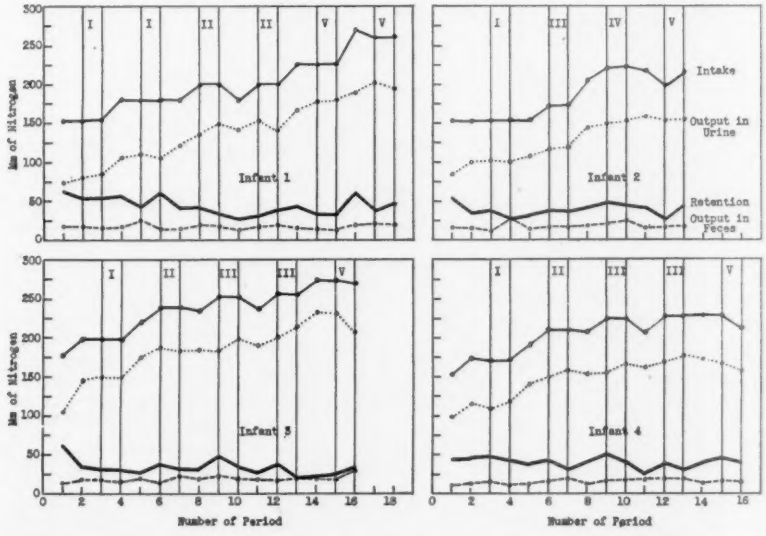

Chart 2.—Nitrogen balance. In this and the following charts the periods during which the milk diet was supplemented are marked by vertical bars. The Roman numerals indicate the nature of the supplement: *I*, Cellu-flour; *II*, dried spinach; *III*, puréed spinach; *IV*, raw spinach, and *V*, an artificial salt mixture corresponding to the salt content of the spinach.

form, was absorbed by the infant's system, but it was not permanently retained. At the same time there was no evidence of increased growth.

Sodium.—The retentions of sodium (chart 3) were fairly uniform for all the experimental periods. The exceptionally large retentions which appear in the cases of infant 2, period 1, and infant 3, periods 2 and 10, cannot be explained on the basis of the diet, since they bear no consistent relation to any one diet. Apparently the increased intake of sodium due to the dried or puréed spinach had no effect on the amounts retained. The use of raw spinach seems to offer an exception

to this statement, for in this case there was a small increase in retention. Further evidence would be necessary to establish this point. The apparent increased retention shown in the mineral salt periods of infants 1 and 2 is probably not real, for these experiments were carried out early in the summer when there was increased loss of salts through the skin because of warm weather. The decreased output of sodium in the urine and its increased output in the feces during the corresponding periods for infant 3 were due to the fact that a diarrhea developed at this time. Cellu-flour, as anticipated, did not influence the retention.

Potassium—Potassium (chart 4) presents much the same picture as sodium, a fair degree of uniformity in retention throughout the periods studied and no consistent effect as a result of the addition of spinach to the diet. Potassium is considered to be the important mineral element

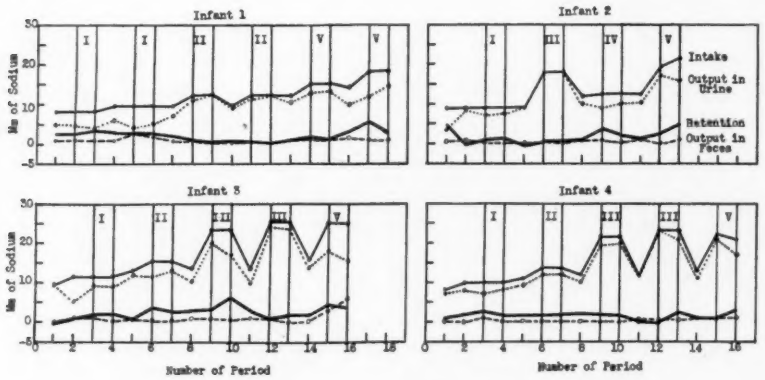

Chart 3.—Sodium balance.

in the growth of cellular tissue. For vegetable substances, the dried and raw spinach offer especially rich sources of potassium. The intake in potassium was increased from 33 to 38 per cent. In practically every case this excessive intake was absorbed by the body, for the output in the feces changed very little, but it was in turn eliminated in the urine and was not utilized for growth. For infant 4, the dried spinach appears to have caused a considerable increase in potassium retention, but it is believed that this represents a normal fluctuation rather than a specific effect of the spinach, since such an effect was not shown consistently by the other infants.

Calcium.—Calcium (chart 5) was eliminated chiefly in the feces. The output in the urine was very small, in no case more than 1 millimol. It is omitted from the chart for the sake of clarity. On the other hand, the weights of the dried feces are included in the chart since,

with the exception of the Cellu-flour periods, they appear to bear a close relation to the amount of calcium eliminated.

Dried spinach appears to have reduced the calcium retention slightly. This is true in seven of eight periods, and the one exception (infant 3, period 6) can be explained. This was a three day period designed to test the immediate effect of the spinach, but there was no stool on the third day. This fact thould be taken into account in interpreting the results for this period in regard to any mineral element the output of which in the feces is significant, such as calcium, magnesium, iron and phosphorus. The stools during the dried spinach periods were considerably more bulky in appearance and weighed more when dried, but

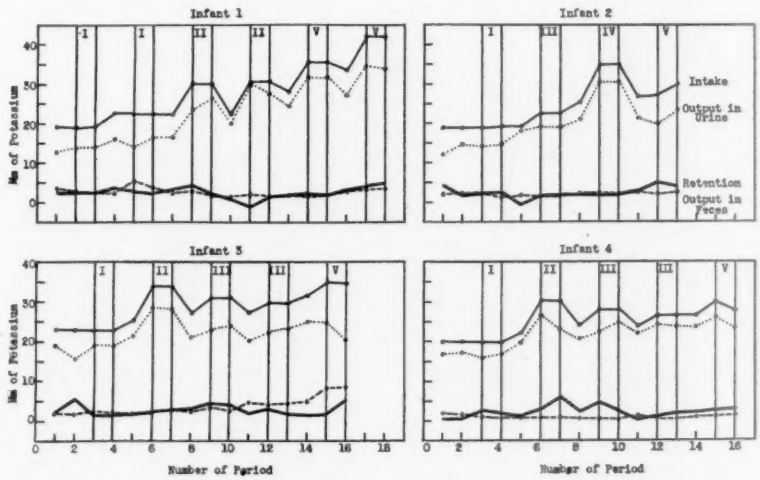

Chart 4.—Potassium balance.

they were for the most part well formed and practically the same in number as in the periods of milk feeding alone.

The effect of puréed spinach on the calcium balances seems to be negligible. Infant 2 showed a slightly increased retention. That of infant 3 was irregular. His output of calcium paralleled the output of feces (dried weight), but there was no apparent relation of either to the spinach in the diet. Infant 4 showed a fairly constant calcium retention during these periods with the exception of period 11, a period on a milk formula alone between periods in which the diet was supplemented with puréed spinach. Such irregularities would seem to be independent of an effect of the spinach and could perhaps be explained as normal fluctuations. As in the case of the dried spinach, the stools were considerably more bulky than in periods on milk alone, but they were not more numerous and were for the most part well formed.

Their dried weight usually increased but not to so great an extent as when dried spinach was used. Judging from the nitrogen content, the diet in both cases contained practically the same amount of spinach. The calcium content of the puréed spinach was slightly higher.

That the decrease in retention produced by dried spinach was not due to the simple increasing of the bulk of the intestinal contents by inert connective tissue is shown by the results of those periods in which Cellu-flour was added to the diet. In all these cases the bulk of fecal matter was greatly increased, 100 per cent or more, although the stools still remained formed and their number as a rule did not increase; in spite of the large bulk of fecal matter, the output of calcium or, conversely, the retention of calcium did not change appreciably. Inert

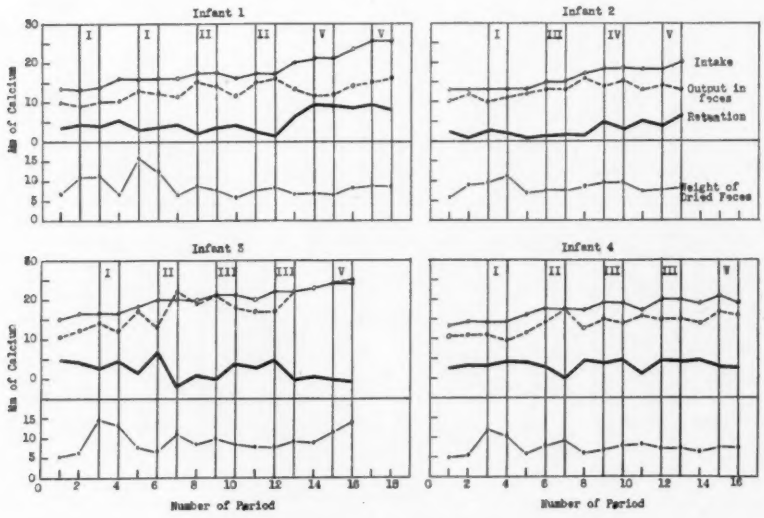

Chart 5.—Calcium balance.

bulk as such had practically no effect on the calcium metabolism of our infants.

With raw spinach there was an apparent increase in calcium retention, but we believe that this effect was due, not to the spinach, but to another factor which seems to have complicated the last periods of both infants 1 and 2 as far as the calcium was concerned. Beginning with period 13 for infant 1 and period 9 for infant 2 there was an exceptionally large increase in calcium retention. This high level was maintained until the end of the experiment. These periods began on May 22 and June 6, respectively, a time of year when the outdoor temperature became warm or hot and the windows of the metabolism ward were left open. Infant 1 lay near the window and derived the

full benefit of the sunshine. Infant 2 was farther from the window, but received his share in the late afternoon. On the days between metabolism studies he was often wheeled out onto the sun porch. Since both of these infants showed an increased retention almost simultaneously, while the other infants, whose metabolism experiments were finished in February, showed no such increase, we believe that the phenomenon was due to the effect of sunlight. Such an effect might be expected when one considers the known effect of cod liver oil in increasing calcium retention and the similarity of its effect to that of sunlight in curing rickets.

Because of this complicating factor the periods in which the calcium was increased by an artificial salt mixture in the case of infants 1

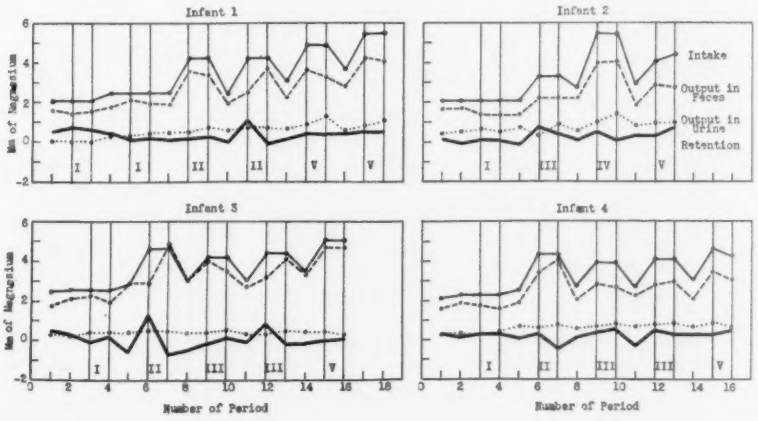

Chart 6.—Magnesium balance.

and 2 would have no meaning. The similar experiments for infant 3 must be discounted because of the diarrhea which developed. Infant 4 showed a slight decrease in retention.

Magnesium.—The magnesium content of spinach is relatively high compared with milk; the magnesium content of the diet in our experiments was increased from 62 to 72 per cent for dried spinach, from 38 to 57 per cent for puréed spinach and 99 per cent for raw spinach. Such a large increase in intake, however, did not appear to result in a corresponding increase in the retention of magnesium (chart 6). There were some gains in retention, especially immediately after the addition of spinach to the diet, but at equilibrium the retentions sank to a lower level. At other times there was no change. In our experiments the retentions of magnesium have been small and very variable. We do not feel justified in assigning any of these changes to the specific effects of the spinach. By far the greater amount of magnesium was elimi-

nated in the feces and in general the amount in the feces paralleled the total output of feces.

Iron.—The effect of spinach on iron metabolism was determined for only two of the infants (chart 7). We have expressed iron values in terms of milligrams because of the small quantities involved. The results were fairly consistent and lead to the surprising conclusion that a young infant does not profit appreciably from the iron in spinach, even though he may show a negative balance. In the case of both infants, the dried spinach, although it increased the iron intake fourfold, resulted in a greater negative balance than was normal for the infant. This was coincident with a slightly reduced calcium balance

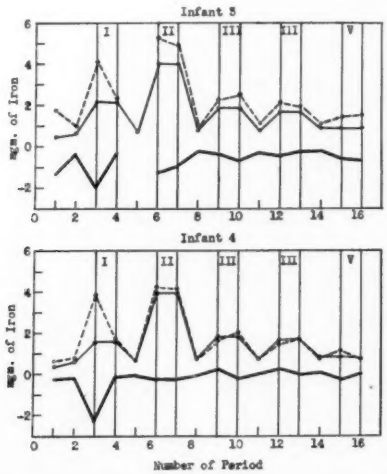

Chart 7.—Iron balance. The light solid line indicates the total intake, the broken line output in the feces and the heavy solid line the balance.

and a greater output of feces. The results with the puréed spinach are not so clearcut, but they do not give much promise of a beneficial effect. For infant 3 there was a slightly greater loss than was normal for the infant. Infant 4 showed a small positive balance in the periods testing the immediate effect of the spinach, but at equilibrium this had disappeared. It is interesting to note that the puréed spinach which we used belonged to the same batch which Farmer and Cory [34] found effective in increasing the hemoglobin of rats made anemic by a milk diet. Our results support the generally accepted belief that the normal infant is equipped at birth with a store of iron which will carry him through

34. Farmer, C. J., and Cory, H. E.: Proc. Soc. Exper. Biol. & Med. **29**:766, 1932.

the first few months of life, the nursing period. His organism appears to be so nicely adjusted that he cannot use additional iron. These are the results on two infants; more data ought to be collected before definite conclusions are drawn. We expect to carry out further experiments along this line.

The effects of the Cellu-flour on iron metabolism are interesting. The Cellu-flour contained iron in appreciable amounts, but this iron was not utilized. The greatly increased bulk in the diet produced by the Cellu-flour brought about a considerable loss of iron at first. However, the infant's system soon adjusted itself to the new conditions and after a few days returned to normal, the loss then being no greater than it was on a diet of milk without roughage.

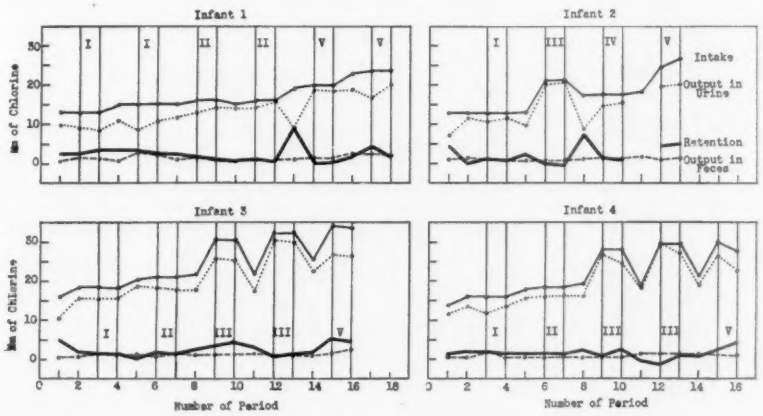

Chart 8.—Chlorine balance.

Chlorine.—Except for a few periods the retention of chlorine (chart 8) paralleled fairly closely that of sodium and, like sodium, it was unaffected by the Cellu-flour or spinach in the diet. The irregularities occurred for the most part in the periods on milk alone.

Phosphorus.—The phosphorus content of spinach compared with that of milk is so low that the addition of spinach to the milk formula increased the phosphorus intake only from 3 to 6 per cent. Such a small increase in intake would not be expected to produce any effect on the retention, and this was the case. The phosphorus retention proved to be remarkably constant. For infants 1 and 2 there was an increase beginning with periods 13 and 9 respectively, coincident with the increase in calcium retention which we attributed to the effect of sunlight. Other fluctuations did not bear any consistent relation to the

presence or absence of spinach in the diet. In general they were caused by fluctuations in the output in the feces rather than in the urine. The infants differed with respect to the relative amounts of phosphorus excreted in the feces and in the urine. The feeding of spinach seems to have had no effect in altering this relationship.

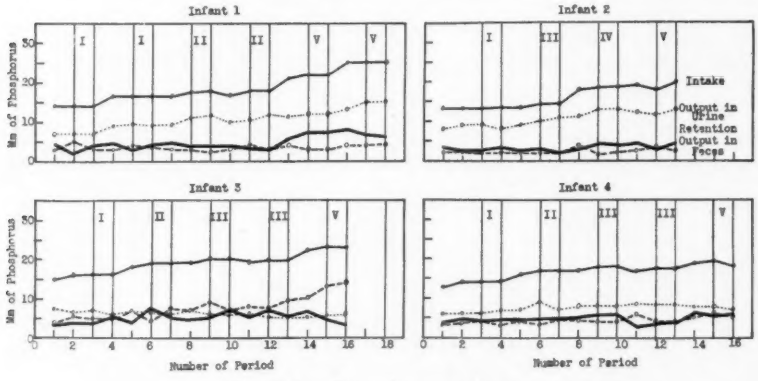

Chart 9.—Phosphorus balance.

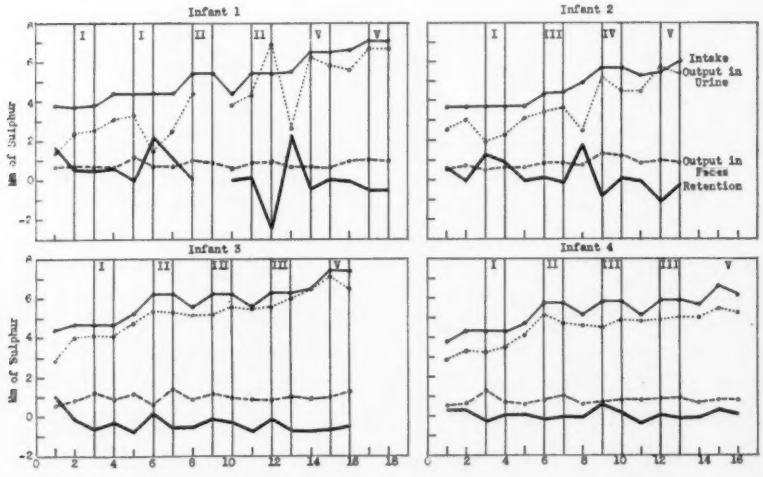

Chart 10.—Sulphur balance.

Sulphur.—The retention of sulphur varied a great deal from one period to another, so much so that the effects of the spinach, if any, were masked. In many cases the output was greater than the intake.

Effect of Roughage on Gastro-Intestinal Motility.—As regards the effect of supplementary feeding on motility, our data so far available show that it has comparatively little effect in the young infant, but

that in the very young animal, such as the dog, the addition of such substances as Cellu-flour increases peristalsis about 50 per cent.

The addition of a vegetable, such as finely puréed spinach, caused only a slight increase in motility over the period of normal milk diet. Young dogs were used for these experiments. Milk and any additions, such as Cellu-flour or vegetable, were introduced into the stomach by tube. By the aid of a dye (carmine), the rapidity of transit of the material through the gastro-intestinal tract was observed and compared with the periods on milk alone.

The effect of such additions on gastro-intestinal motility was less pronounced in the infant. The feces increased in bulk, but the peristalsis in no instance was markedly increased over that in the control period on a milk diet. This may not be true for all forms of vegetable matter, particularly those containing much crude fiber, but it does hold for the forms of spinach fed in these experiments.

COMMENT

The data presented indicate that the feeding of spinach as a rule does not appreciably affect the mineral balance of the very young infant in either direction. Dried spinach may offer a possible exception to this conclusion, since there was evidence that the normal retention which prevails when the minerals are derived solely from milk is slightly diminished by supplementing the milk with dried spinach. Such an effect, however, applies only to the retentions of calcium and iron, elements for which the feces serve as the main outlet. Since there was in general a larger output of feces when the diet included dried spinach, one would be tempted to explain the result as the effect of the increased roughage of the spinach. That this explanation cannot hold appears to be indicated by the data on retention when Cellu-flour supplemented the milk diet. There is in general a correlation between fecal output and calcium intake which makes it possible to explain the increased output of fecal matter and of calcium as a result of the increased formation of calcium soaps. Such an explanation, however, does not appear sufficient to account for the difference between the effects of the dried and the puréed spinach, since the slightly larger increase in calcium intake in the latter case did not result in a correspondingly larger increase in fecal or calcium output. A satisfactory explanation must still be sought.

Puréed spinach, in quantities which we considered suitable for the young infant, did not affect the retentions of nitrogen or of any of the mineral elements appreciably. Edelstein [20] found a diminished retention for nitrogen, calcium and phosphorus in tests with canned spinach and also with freshly cooked spinach. Possibly a difference in

the state of division of the fiber of the spinach is responsible for the difference in results. This question cannot be settled by our experiments with Cellu-flour since the Cellu-flour itself was finely divided.

If the various forms of spinach which we used can be taken as typical of vegetable feeding, our data indicate that the beneficial effect of the addition of vegetable matter to the dietary of the young infant cannot be attributed either to an improved mineral retention or to an increased gastro-intestinal motility. Perhaps the vitamin effect of the vegetable is the sole factor responsible for the increased well-being of the infant to whom it is fed.

SUMMARY

1. Experiments on very young dogs have shown that the feeding of puréed spinach caused only a slight increase in peristalsis over the period on a normal milk diet. Roughage in the form of Cellu-flour increased the peristalsis about 50 per cent.

2. The effect of spinach and roughage on gastro-intestinal motility was less pronounced in the young infant. The feces were increased in bulk, markedly so in the case of Cellu-flour, but the peristalsis was not affected appreciably. This may not be true for all forms of vegetable matter, particularly those containing more crude fiber than the various forms of spinach used in our experiments.

3. The effect of vegetable feeding on the retentions of nitrogen, sodium, potassium, calcium, magnesium, iron, chlorine, phosphorus and sulphur was studied. Our data indicate that the influence of vegetable feeding on the mineral retention is negligible in the case of the very young infant. In some instances, particularly in the case of calcium and iron, addition of vegetables to the diet may lead consistently to slightly decreased retentions. In no case did such feeding produce a consistent increase in retention. Any favorable effect which vegetable feeding may produce must be attributable to such factors as vitamin content or others still unknown.

RICKETS AND HYPERPARATHYROIDISM

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AND
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CHICAGO

The disturbance of calcium and phosphorus metabolism in rickets is only partially reflected in the concentration of these substances in the serum; while a low phosphorus concentration is one of the most constant findings in the active stage of the disease, the concentration of calcium is, generally, either normal or only slightly decreased. There are, however, indications that this calcium level is rather precariously maintained. In infants with rickets, tetany with a low serum calcium occasionally develops, and in animals on a rachitic diet the sudden addition of vitamin D in some form may cause a catastrophal drop in the serum calcium.[1] This instability of the calcium concentration in the serum of the rachitic individual is in marked contrast to the constancy of the serum calcium under normal conditions.

It will be shown in the present report that the serum calcium of the rachitic animal not only may be subject to a sudden decrease, but also can be made to rise to very high values. This may be effected simply by giving rachitic animals a solution of an easily soluble calcium salt by mouth, and the resulting increase in serum calcium is, generally, marked enough to cause the death of the animal from hypercalcemia. It is, perhaps, needless to say that this effect cannot be obtained in normal animals. These experiments show that the serum of the rachitic animal can hold in solution excessive amounts of calcium. In trying to explain this phenomenon, it occurred to us that the same is true of the serum of animals to whom large doses of parathyroid hormone have been administered. It seemed worth while to investigate whether the serum of a rachitic animal contained more parathyroid hormone than that of a normal animal, and for that purpose a method was devised whereby small amounts of parathyroid hormone could be readily demonstrated. By using this method, we have attempted, successfully, we think, to show that the serum in rickets has an abnormally high content of parathyroid hormone.

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1. Hamilton, B.; Kajdi, L., and Meeker, Dorothy: J.Biol.Chem. **88**:331, 1930.

METHODS

The rabbits were made rachitic with a high calcium, low phosphorus diet (McCollum 3143[2]); the calcium in this diet is present, chiefly, in the form of calcium carbonate. Very marked rickets is, generally, obtained on this diet, as evidenced both by roentgenograms of the bones and by low serum phosphorus. The controls were given the same diet plus cod liver oil, about 1 cc. per hundred grams of diet. They did not develop any symptoms of rickets.

We have determined calcium by the method of Fiske and Logan,[3] slightly modified. The accuracy of this method was discussed in a previous paper.[4] Phosphorus was determined by the method of Fiske and Subbarow,[5] p_H by the method of Hastings and Sendroy.[6]

EXPERIMENT I: EFFECT OF CALCIUM ADMINISTRATION TO RACHITIC RABBITS

Table 1 shows the reaction of normal animals to oral administration of calcium chloride or calcium gluconate in varying doses. As might be expected, a rise in the calcium concentration of the serum followed the administration, a rise that showed no definite relationship to the amount of calcium given. Most of the animals received 100 mg. of calcium in the form of chloride (276 mg. of calcium chloride), and the effect of this dose may, briefly, be summarized thus (table 3): In all sixteen animals, the serum calcium before the administration of calcium by mouth was between 2.50 and 3.49 millimols per liter.[7] After the administration, the serum calcium rose, in all sixteen cases, to values between 3.5 and 4.49 millimols per liter.

Table 2 shows the effect of calcium administration to rachitic animals. In this table may be seen several excessively high calcium values. Summarizing the results in animals that received 100 mg. of calcium in the form of chloride (table 3), we find that before the administration of calcium all the twenty-three animals had a serum calcium of 2.50 and 3.49 millimols per liter, that is, within the same range as the normal animals. After the calcium administration, however, the picture is very different from that seen in the controls: in two animals, the serum calcium was between 2.50 and 3.49; in three, between 3.50 and 4.49 (that was the range to which the serum calcium rose in the controls); in six, between 4.50 and 5.49; in six, between 5.50 and 6.49; in three, between 6.50 and 7.49; in two, between 7.50 and 8.49, and in one

2. McCollum, E. V.; Simmonds, N.; Shipley, P. G., and Park, E. A.: J. Biol. Chem. **47**:507, 1921.

3. Fiske, C. H., and Logan, M.: J. Biol. Chem. **93**:211, 1931.

4. Hamilton, B., and Schwartz, Charles: J. Pharmacol. & Exper. Therap. **46**:285, 1932.

5. Fiske, C. H., and Subbarow, Y.: J. Biol. Chem. **66**:375, 1925.

6. Hastings, A. B., and Sendroy, J.: J. Biol. Chem. **61**:695, 1925.

7. Millimols per liter multiplied by four give milligrams per hundred cubic centimeters.

animal, 15.30. A normal or less than normal response was, consequently obtained in only five of the twenty-three animals; in the remaining eighteen the rise was higher than in the controls, often considerably higher.

The death of the rachitic animals after the oral administration of calcium was definitely related to the rise in serum calcium. None of the controls died,[8] but of the rachitic animals only ten of thirty-three survived. Among these thirty-three, deaths were distributed as follows: When the serum calcium rose to 4.50 millimols per liter, which it did in seven animals, all survived. When it rose to values between 4.50

TABLE 1.—*Reaction of Normal Rabbits to Calcium by Mouth* *

Number	Mg. of Ca Given	Type of Ca Salt	Serum Ca		Serum P		p_H		Survived Calcium Administration†
			Before	After	Before	After	Before	After	
147	50	Chloride	2.95	3.20	1.88	1.90	7.38	7.30	Survived
141	50	Chloride	2.90	3.60	1.72	1.84	7.40	7.20	Survived
15	100	Gluconate	3.15	3.28	2.58	2.42	7.38	7.31	Survived
21	100	Chloride	3.10	4.16	1.78	1.69	....	....	Survived
16	100	Chloride	2.95	4.08	1.94	1.98	....	....	Survived
22	100	Chloride	3.03	4.12	1.74	1.69	....	....	Survived
66	100	Chloride	2.98	3.84	1.73	1.65	....	....	Survived
67	100	Chloride	3.12	4.06	1.89	1.86	....	....	Survived
62	100	Chloride	2.95	3.74	1.84	1.79	....	....	Survived
54	100	Chloride	3.01	4.23	1.92	1.96	....	....	Survived
70	100	Chloride	2.88	3.90	1.92	1.90	....	....	Survived
1	100	Chloride	3.12	4.31	1.86	1.76	7.42	7.32	Survived
2	100	Chloride	2.98	4.06	2.12	2.14	7.48	7.28	Survived
3	100	Chloride	3.00	3.65	2.08	2.05	7.44	7.31	Survived
4	100	Chloride	3.05	3.96	2.24	2.16	7.43	7.25	Survived
5	100	Chloride	3.21	3.84	1.69	1.74	7.39	7.30	Survived
6	100	Chloride	3.15	4.20	1.94	1.91	7.45	7.31	Survived
7	100	Chloride	3.02	3.78	1.86	1.83	7.40	7.33	Survived
8	100	Chloride	3.09	4.12	2.30	2.15	7.36	7.24	Survived
10	150	Chloride	3.10	3.80	2.84	2.53	7.35	7.33	Survived
13	150	Chloride	3.20	3.35	2.45	2.30	7.34	7.29	Survived
16	200	Gluconate	3.30	4.70	2.86	3.02	7.32	7.26	Survived
A3	200	Chloride	2.95	3.72	2.46	2.49	7.36	7.32	Survived

The second specimen of blood was taken from ten to fifteen minutes after the administration or calcium. Calcium values are given in millimols per liter of serum.

* Millimols of calcium per liter, multiplied by 4, give milligrams per hundred cubic centimeters.

† Twelve hours or more.

and 5.49, two survived and five died; when it rose to 5.50 or more (nineteen animals), all but one died. In all the fatal cases, the blood was thick and coagulated quickly, just as in hypercalcemia after excessive doses of parathyroid hormone.

It is, we think, of great interest that the marked increase obtained in the serum calcium of most of the rachitic animals took place without any significant change in the concentration of phosphorus. There were three exceptions: In animals 93B, 76 and 6, the phosphorus rose con-

8. Two controls (147 and 141) and one rachitic rabbit (189) were found dead in the cage the morning following the experiment. These have been listed among the surviving rabbits, as death occurred too long after the experiment to be directly connected with it.

siderably. As we have on other occasions noted very high phosphorus values in the serum of dying animals, we think it possible that the poor condition of the animals may explain the increase of phosphorus

TABLE 2.—*Reaction of Rachitic Rabbits to Calcium by Mouth*

Number	Mg. of Ca Given	Type of Ca Salt	Serum Ca		Serum P		p_H		Survived Calcium Administration†
			Before	After	Before	After	Before	After	
149A	50	Gluconate	2.95	4.40	0.94	0.92	7.35	7.30	Survived†
189	50	Gluconate	3.05	4.80	1.15	1.16	7.30	7.35	Survived†
131	100	Gluconate	2.95	7.80	1.26	1.08	7.35	7.26	5 min.
99A	100	Chloride	3.05	4.02	0.97	0.92	7.32	7.28	Survived†
149B	100	Chloride	2.95	4.80	0.74	0.73	7.33	7.33	Survived†
75	100	Chloride	3.10	3.55	0.78	....	....	....	Survived†
69	100	Chloride	3.06	3.98	0.73	....	....	....	Survived†
93A	100	Chloride	3.02	7.21	0.64	0.68	....	....	5 min.
78	100	Chloride	2.92	3.15	0.22	....	....	....	Survived†
80	100	Chloride	2.98	3.35	0.26	....	....	....	Survived†
348	100	Chloride	3.00	7.40	0.72	0.69	....	....	15 min.
388	100	Chloride	2.98	4.90	0.76	0.79	....	....	1 hr.
392	100	Chloride	3.06	15.30	0.58	0.54	....	....	5 min.
393	100	Chloride	3.00	5.20	0.61	0.65	....	....	2 hr.
898	100	Chloride	3.03	5.16	1.02	1.06	....	....	10 min.
899	100	Chloride	2.96	5.72	0.73	0.68	....	....	10 min.
901	100	Chloride	3.00	6.01	0.84	0.80	....	....	1 hr.
904	100	Chloride	3.01	5.50	0.92	0.94	....	....	1 hr.
907	100	Chloride	2.94	7.32	0.73	0.86	....	....	5 min.
911	100	Chloride	2.97	5.68	0.90	0.84	....	....	Survived†
61	100	Chloride	2.95	5.21	1.03	0.98	....	....	1 hr.
49	100	Chloride	2.95	8.31	0.98	1.01	....	....	1 hr.
53	100	Chloride	3.01	5.82	1.02	0.94	....	....	1 hr.
69A	100	Chloride	2.98	5.31	0.69	0.74	....	....	2 hr.
62	100	Chloride	3.01	6.42	0.98	0.84	....	....	2 hr.
93B	100	Gluconate	2.60	11.50	1.06	2.15	7.26	7.00	5 min.
76	100	Chloride	2.75	8.05	0.83	1.57	7.39	7.00	5 min.
2	150	Chloride	2.70	9.05	1.27	1.29	7.36	7.30	15 min.
6	150	Chloride	2.85	6.10	0.78	1.62	7.38	7.12	1 min.
99B	150	Chloride	3.02	3.60	0.98	1.01	7.33	7.28	Survived†
92	150	Gluconate	3.09	7.85	0.58	0.66	....	....	5 min.
1	200	Gluconate	3.15	12.00	1.24	1.22	....	....	5 min.
69	200	Gluconate	2.96	9.03	0.54	....	....	....	5 min.

The second specimen of blood was taken from ten to fifteen minutes after the administration of calcium. Calcium values are given in millimols per liter of serum.

* Millimols of calcium per liter, multiplied by 4, gives milligrams per hundred cubic centimeters.

† Twelve hours or more.

TABLE 3.—*Effect of Ingestion of 100 Mg. of Calcium (as Chloride) on the Serum Calcium of Sixteen Normal and Twenty-Three Rachitic Rabbits* *

Serum Ca, mM/l†	Normal		Rachitic	
	Before	After	Before	Apter
2.50–3.49	16	..	23	2
3.50–4.49	..	16	..	3
4.50–5.49	..	..	..	6
5.50–6.49	..	..	..	6
6.50–7.49	..	..	..	3
7.50–8.49	..	..	..	2
15.30	..	..	..	1

* The figures indicate the number of rabbits having calcium values within the limits indicated in the left hand column.

† Millimols of calcium per liter, multiplied by 4, give milligrams per 100 cubic centimeters.

in these three. They belong to the group of animals who died of hypercalcemia shortly after the blood was taken.

These three animals are exceptional also in another respect: After the administration of calcium, the p_H of the blood dropped to very low

values. The dying condition of the animals may, perhaps, explain this marked acidosis.

In the remaining animals, with two exceptions, a moderate drop in the p_H of the blood took place after the administration of calcium. This was true both of the rachitic and of the normal animals. The acidosis was exactly of the same degree in both groups; the decrease in blood p_H after the administration of calcium cannot, therefore, be made responsible for the marked rise of the serum calcium in the animals with rickets. As to the cause of the acidosis, it is well known that oral administration of calcium chloride in sufficient dose may result in increased acidity of the blood.[9] A more rapid and complete absorption of the acid radical is the cause of this acidosis, and we think this explanation may hold also for the acidosis seen in the animals receiving gluconate. In three of the latter animals, we estimated the amounts of organic acids in the serum and in two of these a marked increase of organic acids was found.

Comment.—These experiments show that if calcium in soluble form and in sufficient dose is given to rachitic rabbits, the serum calcium increases to very high values; in most cases, the increase is so marked that the animals die from hypercalcemia. The same dose of calcium given to normal animals does not produce this effect. The dose given was, in most cases, about 0.55 Gm. per kilogram of body weight, which, probably, is a larger dose than has even been given to infants either for therapeutic or experimental purposes. The usual dose in infantile tetany is considerably smaller, at the most about 1 Gm. per dose. In an infant weighing 5 Kg., this dose corresponds to 0.20 Gm. per kilogram. In rickets uncomplicated by tetany, calcium chloride is not used for therapeutic purposes. Faber[10] studied the effect of calcium chloride, given in doses of 1 Gm., on the serum calcium and phosphorus in rachitic infants, but all his patients either had, or were just recovering from, attacks of tetany. It will appear from the following discussion that the fatal effects of the administration of calcium which we observed could hardly be expected if there were any tetanic tendency.

This hypercalcemia is, we think, due to hyperactivity of the parathyroid glands in rickets.

Hypertrophy of the parathyroid glands in rickets was first described by Erdheim,[11] working on rachitic rats. Erdheim could not find any

9. Gamble, J. L.; Blackfan, K. D., and Hamilton, B.: J. Clin. Investigation **1**:359, 1925.

10. Faber, F.: Undersøgelser over serumkalken og serumfosforet i barnets forste leveaar, Copenhagen, Nielsen & Lydiche, 1928.

11. Erdheim; Denkschr. d. k. Akad. d. Wissensch. Math-naturw. Klasse, Wien **90**:363, 1914; quoted from Ritter.[12]

hypertrophy of the glands in human cases, but that such hypertrophy existed was later shown by Ritter,[12] and especially by the careful and convincing work of Pappenheimer and Minor.[13] The latter authors also showed that the enlargement of the glands was due to true hypertrophy, not, as claimed by Erdheim, to hyperplasia of the individual cells. They could not confirm Ritter's observation that in the rachitic glands there was a predominance of the eosinophilic type of cell (*dunkle Hauptcellen*). Higgins and Sheard [14] showed in 1928 that in chicks growing with insufficient supply of vitamin D and light, hypertrophy of the parathyroids develops, and these authors, together with Wilder,[15] have lately added the interesting observation that this hypertrophy can be prevented by injections of parathyroid hormone. Finally, Stoltenberg [16] showed that marked hypertrophy of the parathyroid glands also develops in the rachitic rabbit.

Hypertrophy of the parathyroid glands in rickets has been explained in various ways. The two main theories are: (*a*) that the hypertrophy is beneficial and compensatory, and (*b*) that it is a primary pathogenic factor. Erdheim advanced the first theory, and as he had found a hypertrophy similar to that in rickets also in osteomalacia and osteitis fibrosa, he suggested that in all these conditions hypertrophy of the parathyroids is compensatory and beneficial. As the function of the parathyroids was very imperfectly known at the time of Erdheim's publication, he had to be rather vague as to the nature of this compensatory action of the parathyroids; it seems that he had in mind some detoxifying hormone counteracting the effect of toxic substances formed in the abnormal metabolism.

This theory, as just mentioned, Erdheim applied to the three diseases, rickets, osteomalacia and osteitis fibrosa. It was rather unfortunate that the last mentioned condition was included in the list, because it was later shown by Mandl [17] that in osteitis fibrosa the action of parathyroid hormone was not beneficial, but rather the opposite. It is now generally accepted that in osteitis fibrosa the hypertrophy of the parathyroids is a primary, causative factor (Wilder [18] and Hunter [19]). Because Erdheim's views were discredited as far as they were applied

12. Ritter, C.: Frankfurt. Ztschr. f. Path. **24**:137, 1920.
13. Pappenheimer, A. M., and Minor, J.: J. M. Research **42**:391 (June-Sept.) 1921.
14. Higgins, G. M., and Sheard, Charles: Am. J. Physiol. **85**:299, 1928.
15. Higgins, G. M.; Sheard, Charles, and Wilder, R.: Proc. Staff Meet., Mayo Clin. **7**:311, 1932.
16. Stoltenberg, L.: Norsk mag. f. lægevidensk. **90**:729, 1929.
17. Mandl, F.: Zentralbl. f. Chir. **53**:260, 1926.
18. Wilder, R.: Endocrinology **13**:231, 1923.
19. Hunter, D.: Quart. J. Med. **24**:393 (April) 1931.

to osteitis fibrosa, there was, at least for a time, a tendency to regard also the hypertrophy of the parathyroid glands in rickets as a primary factor in the development of the disease (Wilder, 1923). Lately, however, the opposite view is again gaining ground (Wilder, 1932). This view, regarding the hypertrophy as a compensatory and beneficial phenomenon, has been advocated particularly well by Stoltenberg.[20] Stoltenberg tested the galvanic reactions of rabbits on a rickets-producing diet and found that in the first two months there were a great number of animals with low values, indicating latent tetany, some even with manifest symptoms of tetany (convulsions). Later, the number of animals with tetany decreased considerably. According to Stoltenberg, the primary metabolic disturbance may lead either to rickets or to tetany, whichever it will be depends on the degree to which parthyroid hyperactivity is able to counteract the tetanic tendency.

The experiments of Higgins, Sheard and Wilder [15] in which the hypertrophy could be prevented by administration of parathyroid extract are, of course, also strong evidence in favor of the compensatory rôle of parathyroid hypertrophy.

We know the important rôle played by the parathyroid glands in regulating the calcium concentration of the serum, and it seems to us that whenever a disease of the bones is found in combination with parathyroid hypertrophy, the behavior of the serum calcium should allow us to make a supposition as to the rôle played by the parathyroids in the development of the disease. If the calcium in the serum is high, as in osteitis fibrosa, that would, we think, indicate a pathologic hyperactivity of the glands. If the serum calcium is normal or low, that would indicate that the hyperactivity of the glands is of a compensatory nature, maintaining, more or less successfully, the level of serum calcium in spite of insufficient absorption of calcium. It is conceivable that in the latter case the parathyroid hyperactivity is indirectly responsible for the insufficient calcification of the bones, as the calcium concentration in the serum may, perhaps, be maintained at the cost of calcium deposition in the bones, possibly even by calcium dissolved out of the bones. The stimulus to parathyroid hyperactivity would be insufficient absorption of calcium, and tetany would result when the parathyroids did not respond to this stimulus, or when the stimulus was not strong enough, as in mild or healing rickets.

Plausible as this theory is, it must be pointed out that as yet there is no proof that rickets is characterized by insufficient absorption of calcium. Numerous balance experiments have shown that in rickets, both clinical and experimental, there is an insufficient retention of cal-

20. Stoltenberg, L.: Studier over eksperimentel rakit, Bergen, J. W. Eides Boktrykkeri, 1928.

cium in the body. Of the calcium ingested with the food, too much appears again in the stools. Whether this calcium in the stool has passed through the intestinal tract unabsorbed, or whether it has been absorbed, refused by the bones, and then reexcreted into the intestines, still remains to be determined.

EXPERIMENT II: CONTENT OF PARATHYROID HORMONE IN THE SERUM OF RACHITIC AND NORMAL RABBITS

Whatever the cause of parathyroid hypertrophy may be, it seems to us that the hypercalcemia after the administration of calcium to rachitic animals must have some connection with this hypertrophy of the parathyroid glands. This hypercalcemia indicates that the serum has an extremely high affinity for calcium; it takes up and holds in solution much larger amounts than the serum of normal animals. In order to find out whether this is due to the presence of more than normal amounts of parathyroid hormone in the serum of rachitic animals, we have developed a method by which small amounts of the hormone can be demonstrated. This method has been published elsewhere.[4] It consists, briefly, of giving calcium chloride by mouth at intervals to normal, full-grown rabbits and following the changes in serum calcium. The rabbits respond to the first dose of calcium with a rise in serum calcium, but every subsequent dose has a smaller effect. One obtains, then, a curve for serum calcium which shows a peak after the first dose and then, gradually, approaches the initial value. If, however, parathyroid extract is injected before the experiment, the curve continues to rise for some time and reaches higher values than in the case in which no parathyroid extract has been given. We have found that about 1.5 units of parathyroid extract (Collip) per kilogram of body weight is the smallest dose to produce this effect; using rabbits of about 2 Kg. weight, we can, therefore, demonstrate the presence of about 3 units of parathyroid hormone in the material we want to test.

This test was applied to the blood of rachitic and normal rabbits (the latter on rickets producing diet plus cod liver oil). The result is shown in table 4. The first two columns in this table give the number and weight of the adult normal rabbit used for the test. The third column shows the material which was injected into this rabbit. The material consisted of whole blood from young rabbits, either rachitic or normal, drawn by heart puncture and injected immediately intramuscularly into the adult rabbit, generally in two or more places. In most cases the phosphorus content of this blood is given, showing values of about 1 millimol per liter in the rachitic rabbits and about 2 millimols per liter in the normal rabbits. This difference in phosphorus content can hardly

have had any influence on the outcome of the tests, as the total amounts of phosphorus injected were very minute, whether normal or rachitic blood was used. The next column (IV) gives the serum calcium of the adult rabbit, into which the blood was injected before the experiment was begun. As soon as the blood sample had been taken for this determination, the blood from the young rabbit was injected into the adult rabbit and 276 mg. of calcium chloride (equaling 100 mg. of calcium) given by mouth. One hour later, the same dose of calcium

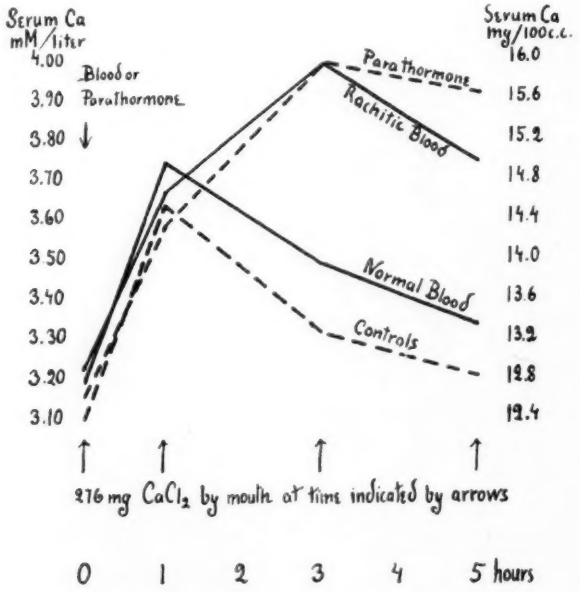
TABLE 4.—*Test for Parathyroid Hormone in the Blood of Rachitic and Normal Rabbits* *

Number I	Weight II	Material Injected III	Serum Calcium 0 Hr. IV	1 Hr. V	3 Hrs. VI	5 Hrs. VII	Max. VIII	Time of Max. for Whole Experiment, Hrs. IX
B144	2,013	8 cc. rachitic whole blood	3.31	3.50	3.75	3.61	3.75	3
B151	1,980	12 cc. rachitic whole blood	3.25	3.53	3.58	3.81	3.81	5
B153	1,710	13 cc. rachitic whole blood	3.26	3.98	4.06	3.94	4.06	3
576A	1,943	13 cc. rachitic whole blood (P:1.03)	3.35	4.03	4.10	4.25	4.25	5
B154	1,850	14 cc. rachitic whole blood (P:0.78)	3.38	3.95	4.03	3.64	4.03	3
W1	1,925	15 cc. rachitic whole blood (P:1.24)	3.24	3.75	4.10	3.57	4.10	3
A483	1,741	15 cc. rachitic whole blood (P:0.69)	3.10	3.62	3.88	3.41	3.88	3
B50	1,920	16 cc. rachitic whole blood (P:0.98)	3.18	3.54	4.02	3.52	4.02	3
B154A	1,850	18 cc. rachitic whole blood	3.30	3.58	3.94	4.01	4.01	5
622	1,635	18 cc. rachitic whole blood (P:1.02)	3.23	3.61	4.01	3.95	4.01	3
B144A	2,030	19.5 cc. rachitic whole blood	3.25	3.55	4.13	3.68	4.13	3
576	1,940	22 cc. rachitic whole blood	3.10	3.50	4.40	3.80	4.40	3
A412	1,730	12 cc. normal whole blood (P:1.94)	3.24	3.85	3.43	3.31	3.43	1
B153A	1,710	12 cc. normal whole blood (P:1.86)	3.23	3.48	3.30	3.32	3.30	1
B166	1,903	13 cc. normal whole blood (P:1.92)	3.25	3.86	3.54	3.32	3.54	1
B151A	1,846	14 cc. normal whole blood (P:1.92)	3.25	3.71	3.58	3.43	3.58	1
B4	1,719	15 cc. normal whole blood	3.10	4.01	3.62	3.38	3.62	1
A571	1,886	15 cc. normal whole blood (P:1.74)	3.20	3.85	3.55	3.38	3.55	1
A607	1,841	15 cc. normal whole blood (P:1.78)	3.06	3.97	3.61	3.40	3.61	1
B144B	2,013	15 cc. normal whole blood (P:2.05)	3.30	3.61	3.38	3.30	3.38	1
M6	2,640	15 cc. normal whole blood (P:1.74)	3.18	3.74	3.49	3.35	3.49	1
B151A	1,980	16 cc. normal whole blood (P:1.92)	3.25	3.52	3.46	3.35	3.46	1

* Values in millimols per liter of serum. Millimols of calcium per liter, multiplied by 4, gives milligrams per hundred cubic centimeters.

chloride was given, and a few minutes later another blood sample was drawn from the adult rabbit. The calcium values obtained from this second specimen of blood are found in the next column (V). They are of comparatively little importance, as at this time the serum calcium may rise quite high after the administration of calcium also in rabbits to which no parathyroid extract has been administered. Three and five hours after the beginning of the experiment, the same procedure was repeated: Calcium was administered by mouth, and a few minutes later a sample of blood obtained. The values obtained for serum calcium in these two samples of blood are given in the next two columns (VI and VII). In judging the outcome of the experiment, these two values are significant. It was shown in a previous paper [4] that if the procedure just described is followed, the rabbits that did not receive parathyroid extract never had values for serum calcium higher than 3.70

millimols per liter in the three and five hour samples, while the injection of parathyroid extract at the beginning of the experiment generally resulted in higher values at this time. We concluded that values between 3.80 and 4 millimols were suggestive, and that values of more than 4 millimols were conclusive evidence that the animal was under the influence of parathyroid extract. The next column in the table (VIII) shows the highest value reached at three or five hours. One rabbit given injections of rachitic blood showed a rise to 3.75 millimols; this value is not significant of any effect from the parathyroid hormone, but the amount of blood given to this rabbit was only 8 cc. Two animals



Average curve for serum calcium after the injection of parathyroid extract, rachitic blood and normal blood. The two full-drawn lines represent the experiments; the two broken lines represent the results of the experiments already published. The lower of the two broken lines shows the effect on the serum calcium of calcium administration alone. Very close to this runs the curve obtained from rabbits injected with normal blood. The two upper curves, representing injection of parathyroid extract (broken line) and rachitic blood (full drawn line), show a high degree of parallelism; parathyroid extract and rachitic blood seem to have about the same effect on the serum calcium.

show values between 3.80 and 3.89 millimols; these values are suggestive but not conclusive. The remaining nine animals had values over 4 millimols, which definitely shows that the rachitic blood had some property identical with that of parathyroid extract. This property was not found in the blood from normal young rabbits; the serum calcium of

the rabbits given injections of normal blood never reached values higher than 3.62 millimols at the three or five hour interval.

In the next column (IX) is given the time of the maximal calcium value during the whole experiment (the previous column gave the maximum at three and five hours). In the rabbits given injections of rachitic blood, the maximum always came later than when normal blood was injected. As mentioned in our previous paper,[4] this displacement of the maximum of the curve takes place when parathyroid extract is given at the beginning of the experiment, and may be taken as corroborative evidence that the animal is under the influence of parathyroid hormone.

In the chart these results are given in diagrammatic form and compared with the results obtained by the injection of parathyroid extract.

Comment.—The first part of our experiments showed that the serum of rachitic blood had a high affinity for calcium. The second part shows that this property is transferable from one animal to another. Administration of calcium to rachitic rabbits resulted in an abnormal rise in serum calcium. Normal rabbits, given an intramuscular injection of rachitic blood and then given calcium by mouth, also responded with an abnormal rise in the serum calcium. This property of rachitic blood is, in its effect, identical with that of parathyroid extract. In a subsequent paper we shall report the effect of p_H and temperature on this property of rachitic blood and compare results with the effect of these same factors on parathyroid extract. So far we have found nothing that would contradict the assumption that the property of rachitic blood to raise the serum calcium of another animal when an injection is made into the muscles is due to an excess of parathyroid hormone in the rachitic blood.

SUMMARY AND CONCLUSIONS

A large dose of a calcium chloride or calcium gluconate, given by mouth, causes a much more marked rise in the serum calcium of rachitic rabbits than of normal rabbits. The rise is generally high enough to cause the death of the rachitic animal from hypercalcemia.

This marked affinity for calcium in the rachitic blood is, we think, due to hyperactivity of the parathyroid glands.

A test for parathyroid hormone, published elsewhere, was applied to the blood of rachitic and normal rabbits. While no reaction was obtained with the blood of the normal animals, the blood from the rachitic animals gave in most instances a markedly positive result. We conclude that the blood of the rachitic rabbits is abnormally rich, either in parathyroid hormone or some other substance with identical effect on the serum calcium.

EFFECT OF LACTOSE ON RICKETS IN RATS

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Lactose has been shown to increase the acidity of the intestinal tract. Rickets seems to be associated with an alkaline reaction in the intestinal tract. Coupling these facts led to this investigation to determine the effect of lactose on rickets.

A connection between increased alkalinity of the intestinal tract and rickets has been pointed out by several investigators.

Zucker and Matzner [1] noted a lowering of the fecal p_H of rachitic rats when antirachitic substances were added to the diet.

Abrahamson and Miller [2] suggested that the lowering of the acidity of the intestinal tract on a rachitic diet, with the resulting formation of insoluble calcium phosphate, might be an important factor in the deficiency of calcium absorption and deposition on rachitic diets.

Grayzel and Miller [3] found that the entire intestinal tract of dogs showed acidity on all the diets used except the rickets-producing diet, which caused a rise in p_H in the intestines.

Tisdall and Price [4] confirmed the results of others that exposure of rachitic rats to sunshine increases the acidity of the feces, but they noted that the changes in acidity do not parallel the antirachitic effect.

Yoder [5] studied the effect of the antirachitic vitamin on the phosphorus, calcium and p_H of the intestinal tracts of rats. Irradiation and the addition of cod liver oil to the rachitic ration lowered the p_H of the intestinal tract and decreased the elimination of calcium and phosphorus.

Redman, Willimott and Wokes [6] gave further evidence to show that a rachitogenic diet for rats develops alkalinity throughout the intestines.

With rickets in children, Redman [7] was not able to show a definite correlation between the hydrogen ion concentration of the feces and

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the different stages of the disease, but she did get a certain degree of correlation between the p_H and the percentage of calcium in the feces.

Jephcott and Bacharach [8] concluded from experiments on rats that the lowering of fecal p_H by the administration of vitamin D is a function of the amount of vitamin D administered. They suggested a p_H test as a means of measuring vitamin D.

Shohl and Bing [9] found that the cure of rickets was not necessarily associated with an alteration of the p_H of the feces from alkaline to acid. This change did not take place when rats were cured by irradiation of the food or by the addition of alkaline phosphates to Steenbock's diet.

Oser [10] showed that the fecal p_H test can be used as a qualitative indication of the presence of vitamin D provided other factors are controlled, but that it fails to approach a quantitative ideal.

Bacharach and Jephcott [11] stated that, provided the experimental conditions laid down by them are rigorously observed, the assay of vitamin D based on the examination of the fecal p_H of rats can be found to have continued useful application.

Heller and Caskey [12] found the p_H of the feces of rachitic rats useful in predicting the most favorable time to take skiagrams and add the dietary supplements to be tested.

The connection between alkalinity of the intestinal tract and rickets suggests the possibility of protection from rickets by lactose, if the lactose ingested reduces this alkalinity. The evidence concerning the effect of lactose on the reaction of the contents of the intestinal tract is contradictory.

Rettger and Cheplin [13] found that the intestinal flora was altered by feeding lactose without great variations in the p_H being apparent.

Robinson [14] did not obtain a consistent change in the reaction of the feces when large amounts of lactose were included in the diet of human subjects. He found, however, that while the normal range was not exceeded, feces from subjects on a heavy lactose diet had a tendency to increase slightly in acidity in passing through the colon, whereas otherwise such material became somewhat more alkaline.

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Dragstedt and Peacock [15] found that with dogs on a diet of white bread, milk and lactose the feces were markedly acid, while with dogs on a diet of boiled rice, beef heart and lactose the feces were not acid in reaction.

Cannon and McNease [16] presented evidence that with a diet high in animal protein the reaction of the contents of both the cecum and the colon of rats varies from p_H 7.0 to p_H 7.1, whereas the addition of lactose may lead to a p_H in the cecum of 4.6 with a p_H of 6.2 in the lower part of the colon.

Hudson and Parr [17] found that a diet containing enough carbohydrate to effect a complete turnover to the simplified gram-positive flora consistently induced a change in the hydrogen ion concentration from nearly neutral to distinctly acid.

Paulson [18] observed, in a patient on whom a transverse ileostomy had been performed, that the degree of ileal alkalinity was somewhat reduced by the addition of lactose and Lactobacillus acidolphilus to the well balanced diet. The average p_H reading had been lowered from 7.65 to 7.46.

Gerstley, Wang and Wood [19] found that a marked lowering of the p_H followed the addition of 3 per cent lactose to whole milk in infant feeding.

Robinson and Duncan [20] noted that when lactose at a 25 per cent level was fed to rats in conjunction with a vegetable ration there was a marked reduction in the p_H throughout the length of the small intestine, cecum and colon. With a high protein ration, the change was less marked, being significant only in the lower part of the ileum and cecum.

Hart and his co-workers [21] fed from 10 to 40 per cent lactose in the basal vitamin D deficient ration to chicks. With 40 per cent lactose, there was a lowering of the p_H in the lower and upper parts of the intestine. It was also evident that lactose had definitely aided in the assimilation of minerals, although it did not prevent rickets in chicks.

Lactose has been shown to increase the absorption of calcium and phosphorus.

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Bergeim,[22] using a slight modification of McCollum's rachitic diet 3143, tested the influence of carbohydrates on calcium and phosphorus absorption in rats. He found that 25 per cent lactose led to pronounced increases in the amounts of calcium and phosphorus absorbed. He believed this to be due to the increased lactic acid fermentation in the intestines with the resulting increased acidity of the intestinal contents. He found that lactose did not prevent the development of rickets on diets high in calcium but low in phosphorus and antirachitic substance.

Inouye[23] found that lactose protected dogs from experimental tetany and increased the calcium content of the blood serum.

Robinson, Huffman and Mason,[24] working with calves, found that the serum calcium was slightly raised during the first part of the period of feeding lactose and then fell noticeably. The inorganic phosphorus of the blood was increased by lactose.

Jarvis[25] stated that his collaborator, Killian, found that rats fed a diet containing lactose as the source of carbohydrate contained a greater percentage of ash at the close of the experimental period than rats fed a similar diet containing sucrose for the carbohydrate.

EXPERIMENTAL METHODS

In all, three hundred and forty-two rats were carried through the experimental period. Litter mates were distributed in such a way that there were control animals in each series. The distribution of the rats for the different modifications of the rachitic diets was as follows:

Unmodified rachitic diets	111
Modified rachitic diets	
Cod liver oil	38
25 per cent lactose	133
25 per cent sucrose	60

The experimental rats were albino rats of the Wistar strain, the stock diet of which was a modification of Steenbock's[26] stock ration. The young rats were separated from their mothers at 22 days of age, and were put on the experimental diets at from 25 to 29 days of age. They were caged in individual cages on raised screens. They were kept in a north room. The light that reached them was filtered through brown wrapping paper or black cambric. The rats were weighed twice weekly. Determinations of the p_H of freshly voided feces were made at least twice a week, LaMotte color standards being used.

22. Bergeim, O.: J. Biol. Chem. **80**:35, 1926.

23. Inouye, T.: Am. J. Physiol. **70**:524, 1924.

24. Robinson, C. S.; Huffman, C. F., and Mason, M. F.: J. Biol. Chem. **84**: 257, 1929.

25. Jarvis, B. W.: Milk Sugar in Infant Feeding: A Study of the Effects of the Routine Use of Milk Sugar in Infant Feeding, Am. J. Dis. Child. **40**:993 (Nov.) 1930.

26. Steenbock, H.: Science **58**:449, 1923.

Sherman's diet 84,[27] McCollum's [28] diet 3143 and Steenbock's [29] diet 2965 were used. The majority of the rats were given Steenbock's diet 2965. The rachitic rations and distilled water were given ad libitum. Records of the consumption of food were kept, but no reliance could be placed on them because of the scattering of food. Yellow corn from four sources was used in Steenbock's ration. From three of these sources it was purchased whole and ground in a mill in the laboratory. The other corn was yellow corn that was ground to a meal in a commercial mill without removing the germ.

The duration of experimental feeding varied from fourteen to forty-three days. Most of the rats were kept on the experimental diet from twenty-five to thirty days.

At the close of the period, the rats were etherized and autopsy performed. Note was taken of the severity of the beading of the ribs at the costochondral junctions. Determinations of the p_H of the last pellet of the feces were made. Roentgenograms of the bones of the hindlegs were taken. The muscles were removed from the bones and the bones placed in a diluted solution of formaldehyde, U. S. P. (1:10) for twenty-four hours. Both the tibia and the femur were then cut lengthwise and used for the line test (McCollum and his associates [28]). With an ocular micrometer, note was made of the width of the cartilage and of the uncalcified area at the metaphysis.

RESULTS

Lactose showed a definite prophylactic effect against rickets when 25 per cent was added to Steenbock's rachitic diet. The experiments in which lactose was fed as a modification of the rachitic diet were repeated many times because the degree of protection afforded by the lactose varied considerably. With the preventive technic, in some lots the degree of protection was only slight, while in others it was rather marked. In all cases the protection was decidedly less than that afforded by cod liver oil. The addition of 25 per cent lactose to the rachitic diet resulted in very little, if any, difference in the degree of rickets when the curative instead of the preventive technic was used.

The first lactose used as a modification of the rachitic diet was not a chemically pure product. The first eleven rats were given this lactose. When it was evident that the lactose was affording some protection against rickets, the reason for this was sought. An attempt to obtain lactose entirely free from vitamin D was made. In all the subsequent experiments chemically pure lactose was used. This lactose was further purified by two recrystallizations in alcohol, and by a twenty-four hour extraction first with alcohol and then with ether (Bergeim [22]). The results obtained with the chemically pure lactose were no different from those obtained before.

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27. Sherman, H. C., and Pappenheimer, A. M.: J. Exper. Med. **34**:189, 1921.
28. McCollum, E. V.; Simmonds, N.; Shipley, P. G., and Park, E. A.: J. Biol. Chem. **51**:41, 1922.
29. Steenbock, H., and Black, A.: J. Biol. Chem. **64**:263, 1925.

It was then thought that the 25 per cent lactose added to the diet might decrease the calcium consumption in the "high calcium" diet sufficiently to account for the difference in the degree of rickets in the rats. The diet modified by sucrose was fed to control rats from the same litters as those fed lactose. While there usually was some difference in the severity of rickets obtained when sucrose was added to the diet, this difference was not as great as in the lactose modification. The rats fed the sucrose modification of the rachitic diet showed either a degree of rickets intermediate between that due to lactose modification and the unmodified diet or rickets practically as severe as with the unmodified diet.

Data in Series of Rats Studied

Rat No.	Sex	Diet Modification	Weight in Grams			Highest Recorded p_H of Feces	Beading of Ribs	Roentgenogram	Tibia		
			Initial	Final	Gain				Line Test	Width of Cartilage*	Uncalcified Area Width*
822	♂	25% C. P. lactose	65	88	23	7.2	Slight	Slight rickets	1	10-12	10-19
825	♀	25% C. P. lactose	59	81	22	7.4	Slight	Slight rickets	1	8-18	12-26
821	♂	25% C. P. sucrose	63	87	24	8.2	Moderate	More severe	0	7-15	20-36
824	♀	25% C. P. sucrose	58	83	25	8.4	Moderate	More severe	0	10-16	29
819	♂	No	58	105	47	7.8	Heavy	More severe	0	15	30
820	♂	No	72	124	52	8.4	Heavy	More severe	0	15	16-35

* The widths of cartilage and uncalcified area are expressed in units of ocular micrometer: 1 unit = 0.06 mm.

Many of the rats persisted in scattering their food, thus having, to a certain degree, the opportunity of selective consumption of food. It was thought possible that the rats receiving the diets modified by lactose chose the coarser particles of food and discarded the finer, thus decreasing the amount of calcium consumed and altering the calcium-phosphorus ratio. In the last tests the corn meal was ground fine enough to pass through a 40 mesh sieve. This would make selective consumption difficult. The rats fed on the diet containing this meal showed the same prophylactic effect of the lactose as did previous lots.

Another factor taken into consideration in seeking for the cause of the milder degree of rickets in the rats fed lactose was that of gain in weight during the experimental period. It was recognized that rickets does not develop in rats which do not grow on the rachitic diets, and in some instances the rats fed the lactose supplements did not make good gains. However, in several of the series, the rats fed diets modified by lactose grew as well or better than the rats fed the diets modified by the other sugars. Even in these series there was the difference in

the degree of rickets. Data from such a series are given in the accompanying table. Roentgenograms of the bones of the hind legs of the same series of rats are shown in the accompanying figure.

In using McCollum's diet 3143 [28] as the rachitic ration, the difference between the control rachitic rats and those fed a 25 per cent lactose modification was definitely less than in using Steenbock's diet. Only eleven rats were fed McCollum's diet modified by lactose. Comparing these with eleven rats fed the unmodified diet, the difference in the degree of rickets was slight. No reason for the different action of the two rachitic diets was found.

Roentgenograms of rats described in the table. Rats 822 and 825 were given the lactose modification of the rachitic diet. Rats 821 and 824 were given the sucrose modification of the rachitic diet. Rats 819 and 820 were given the rachitic diet. The roentgenograms were taken by Dr. Lester J. Williams.

Several unsuccessful attempts were made to get comparative results with Sherman's diet 84.[27] The rats fed the diet modified by lactose lost weight during the experimental period; therefore, no conclusions could be drawn from these tests.

It seems probable that the prophylactic effect which lactose exerts on rickets under the conditions described is due to the lowered p_H of the intestinal tract and the resulting increased solubility of calcium and phosphorus. The rats fed the lactose modification of Steenbock's diet 2965 maintained a much lower p_H throughout the experimental period than did the rachitic controls. In some cases the fecal p_H of these rats continued to be fully as low as the fecal p_H of the control rats fed cod liver oil (a range of from p_H 6.6 to p_H 7.2). With rats on the unmodi-

fied rachitic diet, by the end of the first week the feces became progressively more alkaline; the fecal p_H increased rapidly until by the end of the second week it varied from 7.8 to 8.6. With rats fed the lactose modification of the same diet, the fecal p_H usually did not reach as high as 7.6, and often the highest recorded p_H was 7.2. When the curative technic was used, the fecal p_H usually fell within two days after the addition of 25 per cent lactose to the rachitic diet. From a range of from 7.8 to 8.6, the fecal p_H changed to a range of from 6.4 to 7.6.

COMMENT

The fact that chemically pure lactose, a substance free from minerals and vitamin D, has any effect on the severity of the rachitic condition of rats points to a relationship between the reaction of the contents of the intestinal tract and rickets. On the other hand, it is noted that while lactose maintains the fecal p_H at nearly as low a level as does cod liver oil, it has decidedly less prophylactic effect against rickets. This indicates that the intestinal p_H, with its effect on the solubility of calcium and phosphorus, is only one of the factors in the etiology of rickets.

SUMMARY

Lactose showed a definite prophylactic effect against rickets when 25 per cent was added to Steenbock's rachitic diet. The diet modified by 25 per cent sucrose produced a slightly less severe rachitic condition than the unmodified diet, but the condition produced by the "lactose diet" was definitely less severe than that produced by the other modified diet. This difference was not marked, but it was definite.

In using the curative technic, there was little or no healing of the rachitic condition attributable to the 25 per cent lactose added to Steenbock's rachitic diet.

Lactose maintained the fecal p_H at nearly as low a level as did cod liver oil, but the antirachitic effect was decidedly less.

A SENSITIVE TEST FOR SUBCLINICAL SCURVY IN MAN

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Judged by clinical criteria, scurvy is uncommon in this country. An acquaintance with experimentally produced scurvy, however, indicates that various degrees of deficiency associated with a number of morbid changes can occur without classic symptoms or signs of the disease. My own observations have shown that histologic evidence of scurvy can frequently be found in the costochondral junctions of the ribs of animals which appear to be healthy, and that scorbutic lesions will occur in the incisors of guinea-pigs on experimental diets, unless they are given twice as much antiscorbutic vitamin as is necessary to prevent classic symptoms of the disease.[1] I have further shown that capillary fragility appears in young guinea-pigs within forty-eight hours after the inauguration of a scurvy-producing diet, that the fragility can be measured and expressed numerically, that it increases to a maximum during the course of the disease and that it promptly responds to treatment.[2]

These observations on scurvy in the guinea-pig suggest that a similar condition exists in man, since a close parallel does exist in all studied features of the two in respect to susceptibility and response to the disease.[3] Since it is obviously impractical to study the costochondral junctions or tooth structure in man histologically during suspected early deficiencies,[4] and since the recognized clinical symptoms and signs of the disease are those of late scurvy, the problem is essentially one of finding a more delicate criterion for diagnosis.

A study of the hemorrhagic diathesis in subclinical scurvy has been published recently by Göthlin;[5] in this work he applied the Rumpel-

1. Eddy, W. H.: An Improvement in the Quantitative Assay of the Anti-Scurvy Vitamin (C), Am. J. Pub. Health **19**:1309, 1930.

2. Dalldorf, G.: A Criterion of Hemorrhagic Diathesis in Experimental Scurvy, J. Exper. Med. **53**:289 (Feb.) 1931.

3. Dalldorf, G.: Lesions in Human Teeth in Scurvy, Dental Cosmos **74**:700 (July) 1932.

4. Öhnell (Acta med. Scandinav. **68**:176, 1928) has used tooth examination to diagnose several cases of latent scurvy, but the test is naturally limited to patients from whom permission to remove a tooth may be secured.

5. Göthlin, G. F.: A Method of Establishing the Vitamin Standard and Requirements of Physically Healthy Individuals by Testing the Strength of Their Cutaneous Capillaries, Skandinav. Arch. f. Physiol. **61**:225 (May) 1930.

Leede test to apparently healthy persons. He found 18 per cent of a group of poorly fed school children to have an abnormal degree of capillary fragility, which disappeared after an orange had been added to the daily dietary. Göthlin also observed the development of the hemorrhagic diathesis in two demented persons who were fed diets containing no vitamin C and the disappearance of this sign on administration of orange juice. Definite symptoms of clinical scurvy did not develop in either of these patients during the course of the experiment. Göthlin estimated the daily requirement of these two adults to be from 0.7 to 1 cc. of fresh orange juice, or its equivalent per kilogram of body weight.

In the present studies I have applied to groups of persons a technic which I found useful in studying experimental forms of the disease. The test seems well suited to the detection of subclinical scurvy in man, since it is extremely delicate and since it can be easily applied without discomfort to the patient.

METHODS FOR DETERMINING CAPILLARY RESISTANCE

Two methods of measuring capillary resistance or fragility have been described. In the earlier method, developed by Rumpel and Leede, a constricting arm band is used for a considerable period (usually fifteen minutes). Petechiae occur in varying numbers when a hemorrhagic diathesis is present. This was first recommended for use in studying scurvy by Hess and Fish.[6] Hess recently stated that there are decided individual variations in regard to the reaction to this test, and that it cannot be used alone as evidence of a deficiency in vitamin C intake.[7] György [8] discussed the rôle of the test in the diagnosis of scurvy, and Öhnell [9] first suggested its use in the recognition of mild forms of deficiency. The technic of this test and certain limitations of it have been well described by Göthlin. Wiemer [10] showed that other physiologic factors than the mechanical increase in intracapillary pressure are involved in the results of the test. Further disadvantages are that it cannot be repeated at less than weekly inter-

6. Hess, A. F., and Fish, M.: Infantile Scurvy: The Blood, the Blood Vessels and the Diet, Am. J. Dis. Child. **8**:386 (Dec.) 1914.

7. Hess, A. F.: Recent Advances in the Knowledge of Scurvy and the Antiscorbutic Vitamin, J. A. M. A. **98**:1429 (April 23) 1932.

8. György, P.: Avitaminoses, in Stepp, W., and György, P.: Avitaminosen und verwandte Krankheitzustände, Berlin, Julius Springer, 1927.

9. Öhnell, H.: Some Experiences of Endemic, Manifest and Latent Scurvy in Sweden with Special Reference to New Methods of Diagnosing Latent Scurvy, Acta med. Scandinav. **68**:176, 1928.

10. Wiemer, P.: Das Endothelsymptom, Ztschr. f. d. ges. exper. Med. **78**:229, 1931.

vals on the same arm and that the results must be expressed in two factors, the pressure used and the number of petechiae produced.

In the second method, originated by Hecht,[11] negative pressure is used, applied to the surfaces of the skin through a suction cup connected with a mercury manometer and vacuum pump. Hecht used the test chiefly in exanthems and did not apply it to scurvy, for which it was first recommended by Feig (quoted by Wiemer). Wiemer recently tested many persons and showed in detail the difference in capillary resistance readings in different areas of skin of the same persons, and that excessive stretching of the skin during the administration of the suction may produce petechiae through mechanical stretching of the capillaries without true increased fragility of the vessels. He also classified the conditions and diseases which cause increased capillary fragility and determined the various physical factors which influence it.

Factors Influencing Capillary Resistance (After Wiemer)

1. Factors directly damaging the endothelium
   - (*a*) Poisons, as opium, neoarsphenamine, carbon monoxide, etc.
   - (*b*) Toxins, as scarlet fever, diphtheria, polyarthritis and others
   - (*c*) Metabolic products, as in uremia and acetonemia
   - (*d*) Scurvy
2. Factors indirectly affecting endothelium or capillary tonus
   - (*a*) Physiologic variations, as in menstruation
   - (*b*) Endocrine diseases, as exophthalmic goiter
   - (*c*) Diseases of the spleen and reticulo-endothelial structures

Cutter and Marquardt [12] used a modification of this method by applying a suction apparatus to the finger and searching for petechiae with a skin microscope. Da Silva-Mello devised a simple, portable apparatus for testing by Hecht's method, a spring manometer being substituted for a mercury instrument.[13]

TECHNIC

In the present work I have used the da Silva-Mello instrument which I have recalibrated against a mercury manometer. A small cup with an inside diameter of 1 cm. and with an edge turned out at a right angle to a breadth of 8 mm. has been substituted for the 3.5 cm. diameter cup with a narrow edge used by da Silva-Mello and most earlier workers (fig. 1). The broad edge permits of firm adhesion to the skin, thereby preventing excessive stretching, and the small diameter allows of repeated tests in limited areas. The cup is applied to the outer surface of the arm for a period of one minute, and the resistance of the capillaries is expressed as the least negative pressure required to produce macroscopic petechiae.

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11. Hecht, A. F.: Experimentell-klinische Untersuchungen über Hautblutungen im Kindesalter, Jahrb. f. Kinderh. **65**:113, 1907.

12. Cutter, I. S., and Marquardt, G. H.: Studies in Capillary Fragility, Proc. Soc. Exper. Biol. & Med. **28**:113, 1931.

13. da Silva-Mello, A.: Capillar-Resistometer, München. med. Wchnschr. **41**: 1717 (Oct. 11) 1929.

RESULTS OF SINGLE READINGS IN A GROUP OF PATIENTS ON HOSPITAL DIET

The capillary resistances of 251 patients at Grasslands Hospital are shown in figure 2. The patients were selected to include all age groups and were distributed almost equally between the sexes. All had been patients in the hospital for periods of several weeks and were

Fig. 1.—Capillary resistometer as designed by da Silva-Mello (with modified glass cup).

not suffering from any disease known to produce a hemorrhagic diathesis. Thirty per cent of the adults had chronic pulmonary tuberculosis, which does not influence capillary resistance (Göthlin). The values for persons under 15 years of age represent the late readings for the children of the tuberculosis preventorium, of whom about one fourth had manifest tuberculosis.

As figure 2 shows, great individual variations were found, from persons who bled profusely at 10 cm. negative pressure to others who

had no petechiae at 50 cm. of mercury negative pressure (the limit of the apparatus). Furthermore, the chart shows no age variation, the averages for each five year age group being between 30 and 40 cm. negative pressure. Those patients who did not develop petechiae at 50 cm. pressure (13.6 per cent of the entire group) have been excluded from this computation, since the values for them could not be established. The same rule has been followed in other groups, so that comparisons may be made.

RESULTS OF SINGLE READINGS IN A GROUP ON PRESUMABLY INSUFFICIENT DIET

Single readings were also made of a group of 54 persons, members of the families of the children in the preventorium. This group was selected because the circumstances of the families were well known

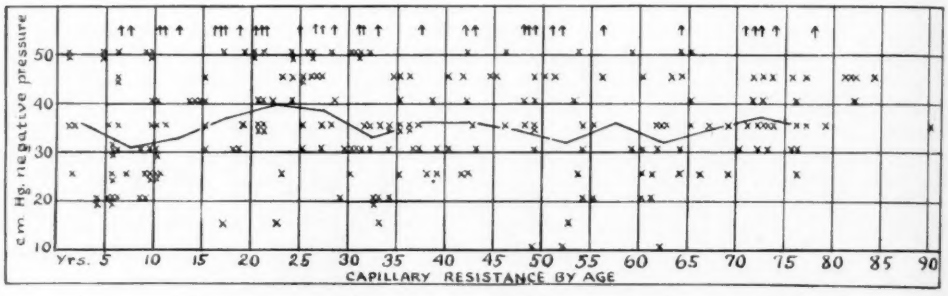

Fig. 2.—Capillary resistance in 251 patients living on hospital diet. The crosses represent positive readings; the arrows, negative readings at 50 cm. of mercury. The curve of averages for 5 year age groups is shown by the solid line.

to the social service department of the hospital, and because the group included only families with small incomes.

The results of this survey need not be given in detail. Individual variations were as prominent as in the first group. The average capillary resistance for the entire group was 25.4 cm. of mercury negative pressure, 10 cm. less than the average for the patients of the hospital. The average for adults and children was practically the same. Fewer members of the group (9.3 per cent) did not bleed at 50 cm. of mercury negative pressure.

RESULTS OF REPEATED TESTS IN A GROUP OF CHILDREN UNDER OBSERVATION DURING IMPROVEMENT IN DIET

The third observed group to be reported was followed for periods of from two to six months. The first members of this group of 52 children entered the hospital during the late fall of 1931, a season of the year when their stored amount of antiscorbutic vitamin might be

considered to be at its peak. Others entered in small groups through the winter months. These children were living in "Sunshine Cottage," a tuberculosis preventorium which is part of Grasslands Hospital. While they were sent to the hospital because tuberculosis was suspected or because they had been exposed to infection in their homes, only 19 had evidence of a manifest form of the disease, while 17 were completely free of the disease, even having negative tuberculin tests.

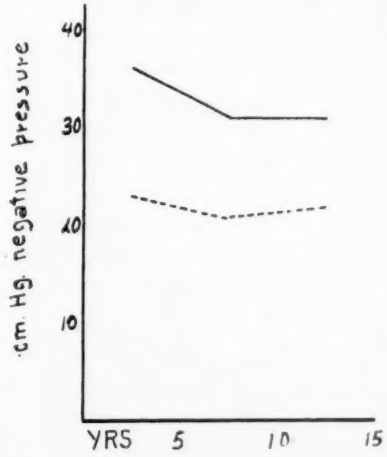

Fig. 3.—Curves representing average capillary resistance of 51 children by 5 year age groups. The readings on admission to the hospital are represented by the dotted lines; the readings after several months' stay in the hospital, by the solid line.

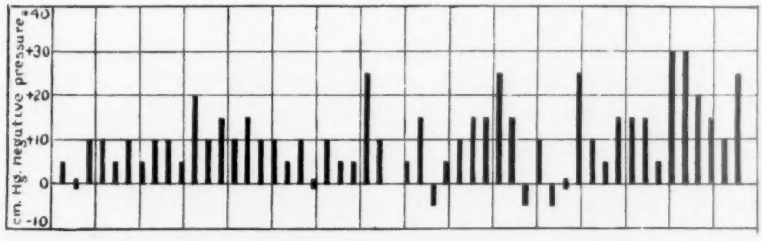

Chart 4.—Changes in capillary resistance of 51 children during improvement in diet. The data are expressed in centimeters of mercury negative pressure. The bars below the base line represent decreased resistance.

During their stay in the preventorium they were given excellent diets, containing, as sources of antiscorbutic vitamin, a daily average of approximately 100 cc. of orange or tomato juice in addition to a quart of milk and daily ration of potato. The group included no bed patients, and all of the children were active at school and play. None received medical treatment other than well ordered routine and ample diet, and, in some cases, correction of such defects as carious teeth and

removal of enlarged tonsils. Daily doses of ultraviolet irradiation formed a part of the routine for a portion of the time.

The first readings secured in this group showed individual variations similar to those encountered in the two other groups. The average values were definitely lower than for the group on hospital diet and was about the same as for group 2 (22 cm. negative pressure as compared with 25 cm. of mercury negative pressure for group 2). These readings were repeated after the children had been in the hospital for several months. Later readings were similar to the averages for the group on hospital fare (fig. 3). In figure 4, the increases and decreases for each child are shown for the same period.

As the charts show, a pronounced increase in the capillary resistance occurred in the group as a whole and in many individual cases. Since it seemed important to determine the precise time when this occurred, recently admitted children have been tested every day during the first two weeks in the hospital. For this period all the children are confined to the detention wards in bed and receive no therapy except that they are given the diet used in the preventorium. The records of two of these children showing increases in capillary resistance are given in figures 5 and 6. It is apparent that in these children the initial increase in capillary resistance preceded the sun-tanning, and that it occurred extremely promptly and rapidly.

COMMENT

A consistent feature of the measurements of capillary resistance has been the difference between persons. This constitutes a serious limitation to the use of the test, since the values secured in a single reading can have little significance unless the normal for the subject is known. This feature may account for Hess' opinion, as previously stated. The factors responsible for these differences are not apparent. I believe that the character of the skin itself partly determines the results of the test. The groups studied included dark-skinned southern Europeans, light-skinned nordic types and persons with intermediate complexions, commonly found among Americans. Göthlin's results, which were more uniform than mine, were obtained from testing Swedish subjects. This limitation, however, does not destroy the usefulness of the test. It may still be used when single readings are made on groups large enough to submerge the individual differences, and it may yield significant results in individual cases when repeated readings are made. Furthermore, in many cases negative or strongly positive readings conclusive in themselves will be secured.

A comparison of groups 1 and 2, in which single readings were made, illustrates the first method of applying the test for capillary

resistance, which avoids the limitation of individual differences. The only known difference between these two groups which might account for the difference in their average capillary resistance is diet. Yet the first group included 13.6 per cent with negative readings, while the second group included only 9.3 per cent, and group 1 averaged positive readings at 35.2 cm. of mercury negative pressure, while group 2 averaged such readings at 25.4 cm. of mercury negative pressure.

Both methods of applying the test have been illustrated in the results secured in group 3. The average capillary resistance for these children when they were admitted to the hospital was 22 cm. of mercury negative pressure, comparable to the values secured in group 2. Presumably under the influence of the diet used at the preventorium, the average

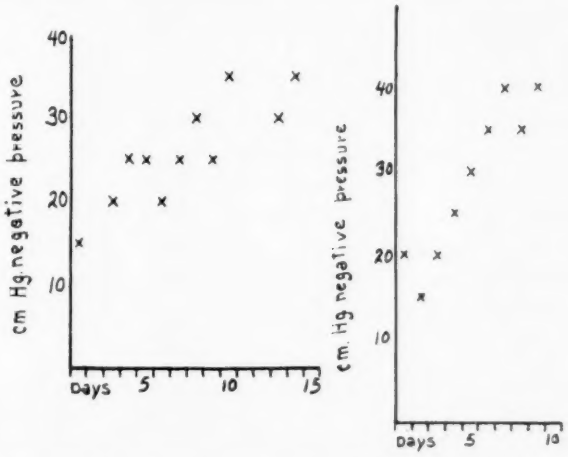

Chart 5.—Repeated readings of capillary resistance on two children during the early days of hospitalization.

resistance increased to approximately the average for group 1. The same phenomenon is shown in the records of individual cases. The two children whose resistance increased 40 cm. came from homes conspicuous for poor dietary and, according to the record, were living on food largely devoid of vitamin C excepting for the uncertain value of small daily amounts of milk. Potato and fresh fruits were not used. Neither of the children was found to suffer from a definite disease entity nor from tuberculosis. They improved rapidly and markedly under the routine at the preventorium and were shortly discharged. Indeed, the last nine cases shown in figure 4 may be said to represent exaggerated cases of malnutrition and underfeeding of vitamin C sources. This group contained but one case of manifest tuberculosis. An interesting comparison may also be made between the first and last half of group 3 as shown in figure 5. The first half of the group

shows a smaller increase in capillary resistance. These children were admitted during the fall of 1931 when, as has been mentioned, the supply of stored antiscorbutic vitamin may be assumed to have been larger than for the rest of the group, admitted during the winter months.

Evidence of dietary deficiencies of various kinds occurred in many of the children. The group as a whole was slightly underweight, anemia was a common feature, and many had signs of obsolete rickets.

The evidence which suggests that in these persons subclinical scurvy is being dealt with is this: The only difference known which would distinguish group 1 from group 2 and which might influence capillary resistance is that of diet, as the only change in group 3 which might be considered to affect capillary resistance is that of diet. No dietary factor other than vitamin C is known to influence the capillaries. There is, furthermore, the analogy with experimental scurvy.

The effects of slight dietary deficiencies on health are not known. Of late years much has been made of the relationship of mild vitamin C deficiency to dental caries, and it has long been known that patients suffering from scurvy are prone to contract infectious diseases. The effect of a lesser degree of vitamin C deficiency on the resistance to infectious diseases is yet to be determined. These and similar problems are fully discussed in recent treatises on nutrition. The prevalence of this dietary stigma among the poorer classes requires further study from the standpoint of public health.

CONCLUSIONS

1. Capillary resistance, as estimated by Hecht's method, may be used as a criterion of subclinical scurvy.

2. Changes in values in an individual case or differences in average values for groups are of diagnostic significance.

3. In a group of children from poor homes the incidence of subclinical scurvy, as estimated by this method, was found to be between 35 and 66 per cent.

HEMANGIO-ENDOTHELIOMA OF THE LIVER IN INFANCY

CASE REPORT AND REVIEW OF THE LITERATURE

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CHICAGO

The rarity of hemangio-endothelioma of the liver in infancy, as evidenced by the report of only fourteen cases in the literature and the difficulties encountered in establishing an accurate clinical diagnosis, has suggested the advisability of reviewing the histories and clinical findings in the previously reported cases. Certain features will be emphasized which should bring to mind the possible presence of this condition.

REPORT OF CASE

History.—Shirley E., a white female infant, aged 5 months, entered the hospital on Nov. 17, 1931. She was the first child, born spontaneously, weighing 8 pounds, 3 ounces (3,713.79 Gm.). Her early development appeared normal; there were no previous illnesses, and the family history was irrelevant. Except for extreme paleness noticed a few days after birth, she was apparently normal until 6 weeks of age, when the abdominal binder was removed permanently and the abdomen was observed to be very large. The abdomen had grown progressively larger since that time. At 4 months of age, the mother observed that the baby breathed with difficulty and became blue when lying down. The blueness and rapid respiration disappeared within from ten to fifteen minutes when the baby was placed in a sitting position. At that time a physician diagnosed a large spleen and anemia. A renal tumor was considered also, and a retrograde pyelography was performed by a urologist. No abnormalities were observed. The child was put on a strenuous anti-anemic regimen of raw liver, inorganic iron, arsenic and copper, and the anemia was said to have improved during the month before admission. Two weeks previous to admission, the baby began to refuse most of her feedings and would retain only small quantities of food, vomiting frequently. At the same time, her bowels became constipated and enemas were resorted to.

Physical Examination.—Examination revealed a pale, white female infant whose respirations were rapid and shallow but who did not appear acutely ill. The temperature was 99.8 F. rectally; the pulse rate 120, and respirations 30. The examination of the ears, nose and throat did not reveal any abnormalities. The costovertebral angle was markedly obtuse. The circumference of the chest was 16½ inches (41.9 cm.) as compared with an abdominal circumference of 20½ inches (52.1 cm.). The lungs and heart were normal. The abdomen was

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Aided by a grant from the John D. Hertz Fund.

From the Sarah Morris Hospital for Children and the Department of Pathology of the Michael Reese Hospital.

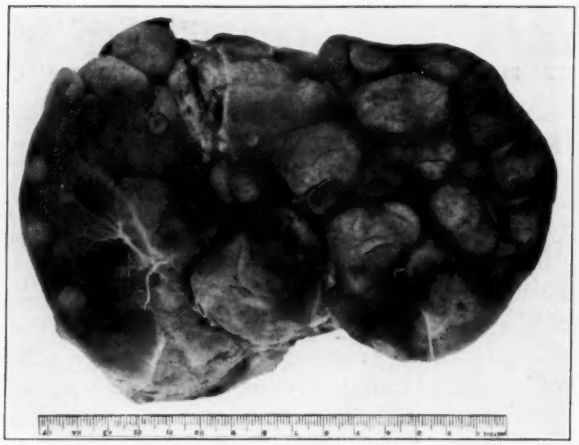

Fig. 1.—Multiple hemangiomas of the liver. Note the nodules of various sizes (posterior surface of the liver).

Fig. 2.—Cut section through the liver. The nodules appear darker than the surrounding liver tissue. The entire organ is almost completely replaced by tumor nodes.

Fig. 3.—Blood spaces lined by endothelial cells. Note the proliferation of endothelial cells in the left lower quadrant. Iron-hematoxylin-eosin preparation; × 60.

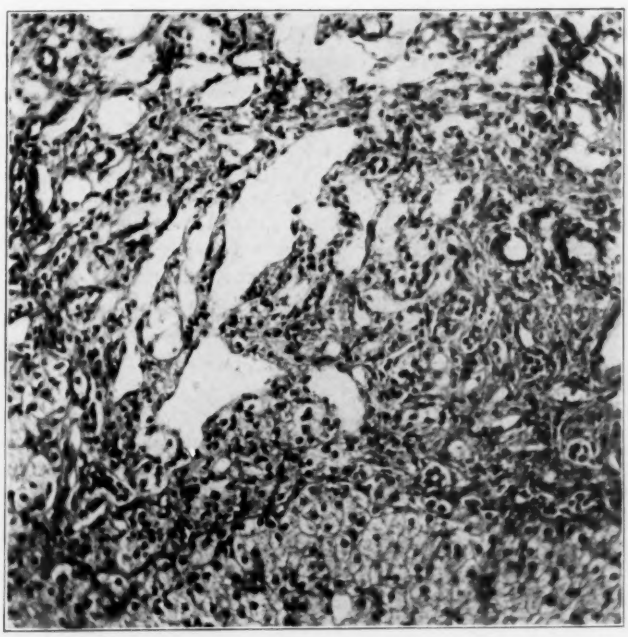

Fig. 4.—Blood spaces lined by endothelial cells, and proliferation of endothelial cells. The lower portion of the picture shows markedly degenerated liver cells. Iron-hematoxylin-eosin preparation; × 160.

greatly distended; bulging was present in both flanks, and the navel protruded. A large mass occupied the entire upper portion of the abdomen and extended down on the right side to the iliac crest and on the left side four fingerbreadths below the costal margin in the midclavicular line. The mass was firm, the edges sharp and smooth and apparently continuous, so that the impression received was that of a tremendously enlarged liver. The spleen could not be outlined. The red blood count was 3,000,000; hemoglobin, from 55 to 60 per cent (Tallqvist); white blood count, 7,500; polymorphonuclear leukocytes, 40 per cent; mature lymphocytes, 55 per cent; immature lymphocytes, 1 per cent; monocytes, 2 per cent and eosinophils, 2 per cent. The urine was normal. An x-ray plate of the chest and abdomen revealed a large liver encroaching on the diaphragm. No other abnormalities were noted. A tentative differential diagnosis of malignant tumor of the right suprarenal gland with metastasis to the liver, primary malignant tumor of the liver and retroperitoneal sarcoma was made.

Operation and Course.—On Nov. 18, an exploratory operation and biopsy were performed by Dr. Alfred A. Strauss. With the child under ether anesthesia, a right rectus incision was made. When the peritoneal cavity was opened, the liver was found to be greatly enlarged, extending down on the right side to the iliac crest and on the left side to the level of the umbilicus. The spleen could not be palpated. The surface of the liver was covered with numerous, purplish-red nodules varying in size from that of a pea to that of a large walnut. They were soft in consistency and somewhat fluctuant. On aspiration with a needle, the feeling was that of penetrating a cyst. A bloody fluid was aspirated. A small section of tissue was taken from a cystic area and from apparently normal liver tissue. The tentative diagnosis at operation was hemangio-endothelioma of the liver. After operation the child became gradually worse, and death occurred in twenty-four hours.

Autopsy.—The peritoneal cavity revealed no evidence of hemorrhage. The liver was markedly enlarged, weighing 765 Gm. Throughout the surface there were many nodules, the largest measuring 3 cm. in diameter (figs. 1 and 2). They were in part purplish red, and in part dark gray; many were fluctuant, others soft in consistency. The organ cut with decreased resistance. On section, it was noted that many of the nodules consisted of cavities filled with partly clotted and partly liquid blood. They were surrounded by a lighter gray zone. A fine network of connective tissue was observed in some of the cavities. The surrounding liver tissue was yellowish and showed the normal markings indistinctly. The gallbladder contained a small amount of bile; the bile passages were patent. No other significant changes were noted at autopsy.

Microscopic Examination.—The liver tissue, which revealed marked fatty changes, was compressed by groups of flattened or cuboidal endothelial cells which lined networks of vascular spaces of varying sizes. In some areas the lining cells formed papillary ingrowths; in others, they had proliferated in compact masses (figs. 3 and 4). The nuclei were uniform and revealed no mitotic figures. In many fields the vascular spaces were found within the parenchyma of the liver, and there was no tendency toward formation of a capsule.

The pathologic diagnosis was hemangio-endothelioma of the liver.

COMMENT

This is the fifteenth case of hemangio-endothelioma of the liver in infancy to be reported in the literature. Foote,[1] in 1919, summarized

1. Foote, J.: Hemangio-Endothelioma of the Liver, J. A. M. A. **73:** 1042 (Oct. 4) 1919.

ten cases, including one of his own. Since then, single cases have been reported by Gödel,[2] Orzechowski,[3] Spiegel[4] and Goodale.[5] The table presents a brief review of the reported cases, arranged in chronological order. Thirteen of them present a rather typical clinical and pathologic picture, and for this reason may be summarized. In all there was a history of a large abdomen at birth or gradual abdominal enlargement noted in the early weeks of life. Gastro-intestinal disturbances such as vomiting, constipation and abnormal stools were frequently noted. Anemia also was frequently observed. An abdominal mass or tumor was first noted by the parents in several cases. Jaundice and ascites were absent in all but two cases (nos. 12 and 14). The course of the disease in all cases was progressive, with termination in death from exhaustion usually before the sixth month. Complications, such as severe gastro-intestinal disturbances and respiratory embarrassment resulting from an encroachment on the lungs by the enlarged liver, hastened the fatal outcome.

Spiegel[4] stressed the importance of a possible familial tendency. In his case the paternal great grandfather was operated on for an unremovable tumor of the liver; the maternal great aunt died at the age of 15 months of an abdominal tumor. This is the only case in which a familial tendency has been mentioned. He also stressed associated congenital anomalies. His patient exhibited undescended testicles and congenital heart defects. In only two other cases were associated congenital anomalies present—a rudimentary gallbladder (Parker[6]) and a defect in the intraventricular septum (Orzechowski[3]).

The recorded gross and histologic findings were similar in all cases: Grossly, the liver is studded with numerous nodules varying from the size of a pea to that of a large walnut. They are dark red to purplish red, sometimes even grayish in appearance, and the consistency of brain or fluctuant. On the cut surface the nodules appear dark red in the center, surrounded by a lighter yellowish zone. Some appear as cavities, the red central areas consisting of partly liquid or clotted blood; others appear as solid tumor masses. Microscopically, multiple layers of endothelial cells are seen in the vascular spaces. In some places the lining cells form papillary ingrowths; in others, they proliferate in compact masses (presumably an attempt to form new blood vessels). Some of

2. Gödel, Alfred: Hämangioendotheliom der Leber, Frankfurt. Ztschr. f. Path. **29**:395, 1923.

3. Orzechowski, G.: Ueber die primären blutbildenden Hämangioendotheliomen der Leber, Virchows Arch. f. path. Anat. **267**:63, 1927.

4. Spiegel, H. A.: Pedunculated Angioendothelioma of the Liver, Arch. Pediat. **46**:188, 1929.

5. Goodale, H.: Hemangio-Endothelioma of the Liver, Arch. Path. **9**:528 (Feb.) 1930.

6. Parker, R. W.: Diffuse (?) Sarcoma of the Liver, Probably Congenital, Tr. Path. Soc. London **31**:290, 1880.

Review of Cases from the Literature

Author*	Year of Publication	Age	Sex	Duration of Abdominal Enlargement	Weight of Liver	Metastases	Additional Pathologic Changes	Comment
Parker.....	1880	5 wks.	?	2 wks.	32 oz.	Retroperitoneal lymph nodes	Rudimentary gallbladder; patches of congenital atelectasis	Both kidneys connected by a mass of new growth which did not invade kidney substance
Chervinsky*	1885	6 mos.	F	1 wk.	943 Gm.	.....	None	
Lendrop....	1893	4 mos.	F	2 wks.	1,625 Gm.	Vertebra 5th dorsal	None	
Brüchanow.	1899	15 wks.	F	3 wks.	710 Gm.	Skin, periosteum of ribs	None	Skin tumor observed at birth
Hewlett.....	1899	3½ mo.	M	Not stated	19½ oz.	Both lungs	None	
DeHaan*....	1903	4 mos.	?	3 wks.	867 Gm.	.....	None	
Bondy*.....	1911	3½ mos.	M	3 wks.	?	.....	None	
Veeder and Austin*	1912	10 wks.	F	Birth	595 Gm.	.....	Two small ulcerations of duodenum near pylorus, 4 mm. in diameter extending through mucosa	Female twin; normal
Stern*.....	1915	6 wks.	F	2 wks.	?	.....	None	
Foote.....	1919	3 mos.	M	1 mo.	750 Gm.	.....	None	
Gödel.....	1923	3 mos.	?	.....	?	.....	None	Weight of liver not given; size, 15 by 8 by 45 cm.
Orzechowski	1927	2½ mos.	F	.....	?	Left lung, multiple in skin	Hemorrhage into ventricles and intestines; defect in intraventricular septum; areas of hematopoiesis	Only case to show hematopoiesis in tumor nodules of liver; marked jaundice
Spiegel.....	1930	13 mos.	M	2 mos.	?	.....	Patent foramen ovale; endocarditis of mitral valve; undescended testicles	Tumor pedunculated, arising from undersurface of liver, 15 cm. in diameter
Goodale.....	1930	11 mos.	M	5 mos.	1,100 Gm.	.....	Enlarged mesenteric nodes; pinhead-sized stone in left ureter	Ascites present; 1,000 cc. clear yellow fluid
Author.....	1932	5 mos.	F	6 wks.	765 Gm.	.....	None	

* The authors indicated are not mentioned in the text. The references to their reports are as follows: de Haan, J.: Primäres Angiosarcoma alveolare multiplex der Leber bei einem 4 monate alten Kinde, Beitr. z. path. Anat. u. z. allg. Path. **34**: 215, 1903. Bondy, Julius: Angiosarcoma of the Liver in an Infant, J. A. M. A. **56**: 873 (March 25) 1911. Veeder, B. S., and Austin, J. H.: Multiple Congenital Hemangio-endotheliomas of the Liver, Am. J. M. Sc. **143**: 102, 1912. Stern, Arthur: Cavernous Angioma of the Liver in a Baby Six Weeks Old, Arch. Diag. **8**: 72, 1915. Chervinsky: Cas d'angiome caverneux multiple chez un enfant de six mois, Arch. de Physiol. **6**: 553, 1885.

the cells are flat; others appear round, oval-shaped or cuboidal. The nuclei are vesicular and may or may not show mitotic figures. There is fibrosis around the nodules, and the adjacent liver tissue frequently shows fatty changes and round cell infiltration.

Foote [1] stated that this disease in infancy is congenital and undoubtedly exists at birth, arising from endothelium which has never lost its embryonic characteristics. Hemangio-endotheliomas of the liver in adults are believed to have two sources of development. Such tumors may arise either from benign angioma, the endothelium reverting to the embryonic type, or from fetal inclusions that have remained dormant over a long period of time. These adult tumors are very similar histologically to the infantile type, but they exhibit a greater degree of malignancy, as evidenced by the more rapid and greater degree of endothelial proliferation, the more frequent appearance of mitotic figures and their greater tendency to infiltrate the surrounding tissue and to metastasize to other organs. Hachfeld [7] reported a case in which the tumor invaded the lymph glands surrounding the portal vein, and metastasized to the lungs. Examination in Schönberg's [8] case revealed metastases in the lungs. In the case reported by Neubürger and Singer,[9] the tumor had metastasized to the suprarenal glands. Puhr [10] found metastases in the pancreas. Dassel's [11] patient exhibited the greatest systemic involvement—metastases in the spleen and in the bones of the skull and ribs. Metastasis was recorded in five of the fifteen (33 per cent) cases occurring in infants. Parker [6] described a new growth in the retroperitoneal lymph nodes connecting both kidneys. The tumor did not invade the kidney substance. Lendrop [12] found a metastatic tumor in the fifth dorsal vertebra. Brüchanow,[13] whose patient revealed tumor nodules in the skin at birth, also found at autopsy a metastatic tumor involving the periosteum of the third and fourth ribs adjacent to the

7. Hachfeld, M.: Primärer Leberkrebs nach zirrhotische Schrumpfung bei narbiger Obliteration der Vena cava inferior oberhalb der Leber. Primäres malignes Endotheliom der Leber, im Bilde einer Leberzirrhose, Inaug. Dissert., Halle, 1914.

8. Schönberg, S.: Das Hämangioendotheliom der Leber, Frankfurt. Ztschr. f. Path **29**:77, 1923.

9. Neubürger, K., and Singer, L.: Zur Frage des diffüsen Hämangioendothelioms der Leber, Frankfurt. Ztschr. f. Path. **35**:543, 1927.

10. Puhr, Ludwig: Ueber das sogenannte primäre Hämangioendothelioma der Leber, Ztschr. f. Krebsforsch. **34**:503, 1931.

11. Dassel, A.: Ueber ein metastasierende Hämangioendotheliom der Leber, Frankfurt. Ztschr. f. Path. **36**:99, 1928.

12. Lendrop, O.: Et tilfaelde af leversarkom hos et spaedt barn, Hospitalstid. **8**:217, 1893.

13. Brüchanow, N.: Ueber die Natur und Genese der cavernösen Hämangiome der Leber, Ztschr. f. Heilk. **20**:131, 1899.

spine. Hewlett [14] mentioned tumor nodules in the lung. Orzechowski [3] described metastases in the left lung and skin.

COMMENT

The term hemangio-endothelioma was first applied by Mallory [15] relative to a certain group of skin tumors. He separated slow-growing tumors in which definite vessels are formed (angiomas) from those in which the cells grow rapidly, frequently proliferating in solid masses (endotheliomas). These endotheliomas arising from the blood vessels he called hemangio-endotheliomas. He considered them true blastomas. Since his original application of this term to skin tumors, it has been adopted to include similar tumors arising in other parts of the body. Foote [1] has suggested the name hemangio-endotheliosarcoma because of the malignant nature of the tumor and the resemblance of certain structures to those of sarcoma. However, this addition is only confusing, as it indicates a new growth of presumably two different origins. To denote the malignant nature of this tumor and its derivation from endothelium, and to avoid the confusion of the term sarcoma, Schultz [16] advocated the term endothelioblastoma.

SUMMARY

Hemangio-endothelioma of the liver in infancy is a rare disease. The report of an additional case brings the total number in the literature up to fifteen. The clinical and pathologic pictures in thirteen of the previously reported cases and my own are rather typical and are therefore summarized. Metastases in other organs occurred in 33 per cent of the cases.

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14. Hewlett, H. M.: Primary Sarcoma of the Liver in a Child Fourteen Weeks Old, Intercolon. M. J. Australas. **4**:615, 1899.

15. Mallory, F. B.: The Results of Application of Special Histological Methods to the Study of Tumors, J. Exper. Med. **10**:575, 1908; The Pathology of Malignant Disease of Non-Epithelial Formation, J. A. M. A. **55**:1621 (Nov. 5) 1910.

16. Schultz, O. T.: Tumors of Infancy and Childhood, in Abt, I. A.: Pediatrics, Philadelphia, W. B. Saunders Company, 1926, vol. 8, p. 856.

Case Reports

MONGOLISM IN MONOZYGOTIC TWINS

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The appearance of mongolism in both twins is of relatively rare occurrence, and the literature contains only six previously recorded cases. In her excellent monograph on mongolism, Brousseau [1] reviewed the literature on mongolism in twins. Recently, Bauer [2] made a more detailed and extensive review in which he presented two additional cases and discussed the importance of twin material for the investigation of the etiology of mongolism. To the list of cases reported in Bauer's review must be added additional ones by Waring,[3] Novak [4] and Petzoldt.[5] By a comparison of the reports mentioned, I find that the number of recorded cases of mongolism in one of presumably dizygotic twins is thirty-eight and of monozygotic twins (both being mongolian idiots), seven (including the present case). Six additional cases are on record in which the information is too scanty to permit classification. This makes the grand total of fifty-one cases of mongolism in twins.

History.—Charlotte and Garnet J. were admitted to the isolation ward of the Minneapolis General Hospital, on July 8, 1932, and during their stay I was given an opportunity to make a study of the case.[6] The twins were the eleventh of twelve births resulting in fourteen children, the tenth birth also resulting in girl twins. In addition, the mother reported one miscarriage. At the time of the birth of the mongolian twins, the father was 51 years old and the mother 44, while the age range of the siblings was twenty-six years. I visited the home, and though the socio-economic status was rather low, the parents and the siblings were apparently normal physically and mentally. There was no history of multiple births on either the paternal or the maternal side, and there was no history of mental deficiency.

From the University of Minnesota.

1. Brousseau, Kate: Mongolism, Baltimore, Williams and Wilkins Company, 1928, p. 203.

2. Bauer, Alfred: Über die Ätiologie des Mongolismus an Hand der bisherigen Ergebnisse der Zwillingserforschung, Arch. f. Kinderh. **90**:169 (May 24) 1930.

3. Waring, J. I.: Mongolism in one of Twins, Am. J. Dis. Child. **41**:351 (Feb.) 1931.

4. Novak, J.: Beitrag zur Zwillingspathologie, Zentralbl. f. Gynäk. **55**:69 (Jan. 10) 1931.

5. Petzoldt, Gertrude: Mongolismus bei einem von Zwillingen, Monatschr. f. Kinderh. **47**:174 (June) 1930.

6. Dr. E. J. Huenekens, head of the pediatric department, cooperated in making this study, and gave me permission to make use of the hospital records for checking my own findings.

The mother reported that the birth of the mongolian idiots was quite difficult; it occurred about three weeks prematurely, and both of the twins were delivered by forceps. The weights of the twins at birth were rather unusual, being reported as 7½ pounds (3,402 Gm.) and 8 pounds (3,628 Gm.), which is considerably above the average birth weight of twins. The infants were bottle fed, and were very easy to care for during the first year, as they slept most of the time. Their health was good, except that Garnet had an attack of pneumonia when she was 3 weeks old, from which she barely recovered. The other twin suffered from a severe cold at the same time. Both had measles at 6 years, but they had experienced no other severe diseases. The only serious accident occurred to Charlotte, who sustained a fracture of the leg a year prior to her admission to the hospital.

The mother reported that the physical and mental development of the twins was very retarded. They sat alone when slightly over 2 years old, and learned to walk when about 4, largely through imitating their younger brother. About a

Fig. 1.—Garnet and Charlotte J.

year before admission to the hospital they learned to handle a spoon when eating. They had never learned to talk, although they seemed to attempt some communication, mostly by signs and grunts. They gave evidence of understanding simple commands, particularly admonitory ones. The mother indicated that they had attempted such simple sounds as "dada," "kitty," "bye-bye," etc. They were fairly active, and had been good playmates until lately, when they seemed to tire easily of each other. Their appetities were abnormal; they would eat practically anything that was offered to them, despite which digestive disturbances were infrequent. Their favorite position was to sit with their legs folded under their buttocks (Buddha position) in a manner which would be very uncomfortable for the normal child of 10. They were filthy in their habits, control of urination and defecation never having been established.

Examination.—Physical examination resulted in the following findings: The craniums were nearly normal in size and shape, though the occipital regions were somewhat flat. The faces were concave. The tongues were large and fissured, and the papillae were hypertrophied. The palates were high and narrow. The

tonsils and pharynges were not particularly abnormal, though smaller than normal and somewhat injected. The gums were retracted, exposing the roots of the small, irregularly placed and carious teeth. The palpebral fissures were narrow and slanting, the latter probably being more apparent than real, owing to the poorly developed supra-orbital ridges. The noses were flat and saddle-shaped, with poorly developed bridges. The epicanthal fold so typical of mongolian idiots was present in both of the twins. The mouths were round and drooped at the corners. The lips were slightly everted, and constant drooling was present. The mucous membrane of the nasal passages was thick and boggy, with chronic rhinitis, causing almost complete occlusion and necessitating mouth breathing. The eyes responded poorly to light but quite well to accommodation, and there was no strabismus or nystagmus. The hands were wider and the fingers shorter than normal, and the typical incurving, short little finger was present. The integument was normal, except for excoriations around the buttocks and a similar condition of the lips and the faces, which were broken out. The feet were somewhat wider than normal, with widely spaced big toes. Pronounced respiratory arrhythmia was present in both girls. A systolic murmur was heard in both hearts, particularly at the

Fig. 2.—Garnet, showing concave profile, saddle-shaped nose and everted, drooping mouth.

apex; this was more pronounced in the case of Garnet. Rather long but sparse pubic hair was present on the genitalia of both twins, though no axillary hair was present, and the mammary glands were immature. The general musculature was characterized by pronounced hypotonus, particularly of the abdominal wall, which, together with a great deal of subcutaneous fat in this region, resulted in potbelly. The joints, particularly those of the arms, hips, knees and neck were characterized by hyperflexibility. No hernia was found. The size of these 10 year old girls corresponded to that of normal 7 year old children, though they were heavier. They appeared to be well nourished and in good health.

The laboratory findings were negative. The erythrocyte count for Garnet was 4,460,000, that for Charlotte, 4,320,000; the leukocyte counts were 5,500 and 4,500, respectively, while the hemoglobin reading was 89 per cent in both cases. No record of the Wassermann reaction of the blood or of the grouping of the blood was obtained.

ANTHROPOMETRIC OBSERVATIONS

I was particularly interested in determining whether or not the twins were of the monozygotic kind. As the placental organization was unknown and there was no possibility of securing the necessary infor-

mation, it was necessary to resort to a number of comparisons which have been demonstrated to possess high reliability. In general, I have made use of the method advocated by Stocks;[7] in addition, I have compared the prints of the palms and soles, the color of the eyes and hair and the general resemblance. The pigmentation of the eye was identical, with a value of M15 as measured by the Saller eye chart.[8] The hair was also practically identical with respect to color, coarseness and sparseness. It was planned to make rather complete anthropometric measurements of external body dimensions, but the constant struggling of the twins while being measured indicated that such measurements would have low reliability, and hence only certain measurements of the head are reported together with the weight (accompanying table).

The finger prints were found to be very similar, with a decided homolateral resemblance between the twins, the prints of the right hand of one twin being more like those of the right hand of the other

Measurements of Heads of Charlotte and Garnet

	Charlotte	Garnet
Weight	38.5 lb.	39.0 lb.
Height	96.5 cm.	99.0 cm.
Fronto-occipital diameter	15.7	15.5
Transverse diameter	12.4	12.4
Fronto-occipital circumference	46.2	45.9
Interpupillary distance	6.4	6.2

twin than those of her own left hand; this is usually found in identical twins. The patterns on all twenty fingers were loops of the ulnar kind. With respect to prints of the palms the findings were similar. Again the homolateral resemblance was greater than the heterolateral resemblance of each twin, a condition which Newman[9] has shown to be usual in monozygotic twins. The prints of the palms were formulated according to the standard scheme worked out by Cummins and others[10] with the following results:

Charlotte	Right	11.9(10).7(8).5′ -tt″- L^{u}.0.0.1.0
	Left	11.9 .7 .5′ -tt″- L^{u}.0.0.1.0
Garnet	Right	11.9(10).7(8).5′ -tt″- W.0.0.1.0
	Left	11.9 .7 .5′ -tt″- L^{u}.0.0.1.0

7. Stocks, P.: A Biometric Investigation of Twins and Their Brothers and Sisters, Ann. Eugenics **4**:49 (April) 1930, particularly pp. 96 and 97.

8. Saller, K.: Eine neue Augenfarbentafel, Ztschr. f. d. ges. Anat. (Abt. 2: Ztschr. f. Konstitutionslehre) **15**:674, 1930.

9. Newman, H. H.: Palmar Dermatoglyphics of Twins, Am. J. Phys. Anthropol. **14**:331, 1930.

10. Cummins, H.; Keith, H. H.; Midlo, C.; Montgomery, R.; Wilder, H., and Wilder, I. W.: Revised Methods of Interpreting and Formulating Palmar Dermatoglyphics, Am. J. Phys. Anthropol. **12**:415, 1929.

Owing to the difficulty of securing legible prints, the soles were formulated by inspection. As indicated by the formulations, the soles were very similar, the only real difference noted being the presence of a vestigial loop in the fourth interdigital space of Garnet's right foot, while the corresponding space on Charlotte's right foot was an open field. There was also mirror imagery of the third interdigital area in the case of Charlotte's left and Garnet's right foot. The formulations are as follows:

Charlotte	Right	$L^d.0.0\ .0LV^h$
	Left	$L^d.0.L^d.0.LV^h$
Garnet	Right	$L^d.0.L^d.V.LV^h$
	Left	$L^d.0.0.0.\ LV^h$

As a final check on the monozygosity of the twins, I applied Stocks' series of comparisons. In order to fulfil the conditions necessary for monozygosity at least seven of the ten finger prints of the twins must be practically identical when compared homolaterally; in this case eight of the finger prints were identical. The difference in height must not be greater than 6.9 cm.; the difference in length of the head, breadth, circumference and interpupillary distance must not be greater than 0.55, 0.45, 1.3 and 0.3 cm., respectively. If not more than one of these differences exceeds the values listed, the twins may be regarded as monozygotic. As the present case fulfils all of the requirements of the Stocks comparison, and, in addition, the findings are within the range found to obtain for identical twins with respect to hair, eyes, and friction ridge comparisons, one may conclude that they are monozygotic.

In conclusion, I wish to point out the service that physicians can render by reporting in full cases of twins in which unusual or little understood pathologic conditions are present, accompanied by findings concerning placental organization when possible, or, lacking that data, sufficient data on a number of different comparisons to enable a practically certain diagnosis of type of twins to be made. It is of particular importance to diagnose the type of twins when only one of them is abnormal. Twin material is particularly well fitted for contributing evidence concerning the etiology of pathologic conditions which appear to be hereditary, for even a single case of certainly monozygotic twins in which one twin was normal would constitute strong evidence against heredity as an etiologic factor.

HEREDITARY ELEPHANTIASIS

CONGENITAL ELEPHANTIASIS, HEREDITARY EDEMA, TROPHEDEMA, MILROY'S DISEASE

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AND
HARRY R. LUSIGNAN, M.D.
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The condition variously known as Milroy's disease, hereditary edema, trophedema and congenital elephantiasis with a familial or hereditary incidence is so rare that another instance of it deserves to be recorded.

REPORT OF A CASE

History.—Robert G., born on Oct. 10, 1916, was admitted to the hospital on Oct. 7, 1929; the complaint was swelling of the legs since birth and swelling of the scrotum for the past two months. The maternal grandmother and the mother had had enlargement of the legs since childhood. The mother died of influenza in 1918, and the complete family history was unobtainable. The maternal family came from southern France, in the high Pyrenees Mountains. The patient had a brother who was normal. Birth occurred at full term and delivery was normal. It was said that the child would never walk. The patient had mumps at 10 years of age. His school record was excellent, and he played football and basket ball without excessive fatigue.

The legs had probably been swollen since birth, but this condition had caused few local symptoms. When the patient was 10 years of age, cramps of the legs occurred after exertion; they had recurred rarely since then, and only after severe exertion. The legs had occasionally become somewhat cold after exposure, and were somewhat larger in the evening or after prolonged standing; conversely, they were somewhat reduced in size after rest, but the swelling never disappeared entirely. They felt somewhat heavy in running. The patient had never had attacks of chills, fever, local heat or hyperemia of the legs. There had never been ulcers or other lesions of the skin, except abrasions and bruises which had given no trouble in healing. The patient had good endurance in athletic activities.

About two months before we saw the patient the scrotum suddenly became much enlarged. This condition did not follow any definite injury and was painless.

Examination.—Physical examination revealed a well grown, well nourished boy. The teeth were rather poorly cared for; the tonsils and the anterior and posterior cervical and the axillary glands were moderately enlarged, but the inguinal glands were not. The thyroid was slightly enlarged. Examination of the heart, lungs and abdomen gave negative results. The scrotum showed marked bilateral enlargement. The skin was tense but apparently not edematous. Light was well transmitted. The testes could not be plainly felt.

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There was a symmetrical but unequal swelling of the feet, legs and thighs, which was most marked in the most dependent portions, especially in the dorsa of the feet and ankles. The swelling diminished progressively upward, so that in the upper part of the thighs it was difficult to determine. The skin appeared smooth, warm, of a normal color and thickened. On firm, somewhat prolonged pressure, definite pitting was elicited, which was most marked on the dorsa of the feet and over the lower third of the tibia. When the skin was stroked with a blunt point, from the upper part of the thigh to the lower part of the leg, a band of pallor widening from above downward was produced which lasted a few

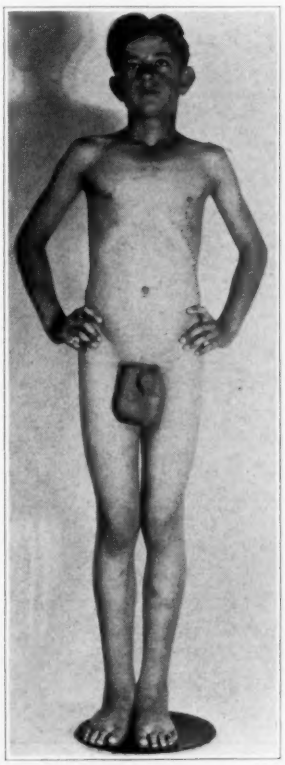

Fig. 1.—The enlargement of the legs and feet has been diminished by rest in bed; it is, however, plainly visible in the feet. Note the large bilateral hydrocele.

moments and was then replaced by hyperemia. The circumferences of the limbs were as follows: right midthigh, 37 cm.; left, 35 cm.; right midcalf, 31 cm.; left, 28 cm.; right ankle, 25.5 cm.; left, 25 cm. No sensory or motor disturbances could be found.

Laboratory and Special Tests.—Examination of the blood, urinalysis and the Wassermann test gave negative results. The basal metabolic rate on one test was —3 per cent. The Aldrich-McClure intradermal test for salt disappearance showed the normal persistence of the wheal for more than sixty minutes in both arms, thighs and calves; on the dorsum of the right foot, the wheal disappeared

in forty minutes and on that of the left foot, in forty-six minutes. The injection of 0.2 cc. of a 1:5,000 solution of histamine in both the face and legs caused the appearance of a flush in twenty-five seconds and its disappearance in sixty seconds. Roentgenograms of the soft tissues of the legs, taken as recommended by Reichert, showed swelling marked by heavy trabeculation in the subcutaneous tissue, which had a radial arrangement in the legs; the changes were less marked in the thighs. The sacrum showed nonfusion of the neural processes of the first and second segments, that in the first being about 1 cm. wide and that in the second being just perceptible.

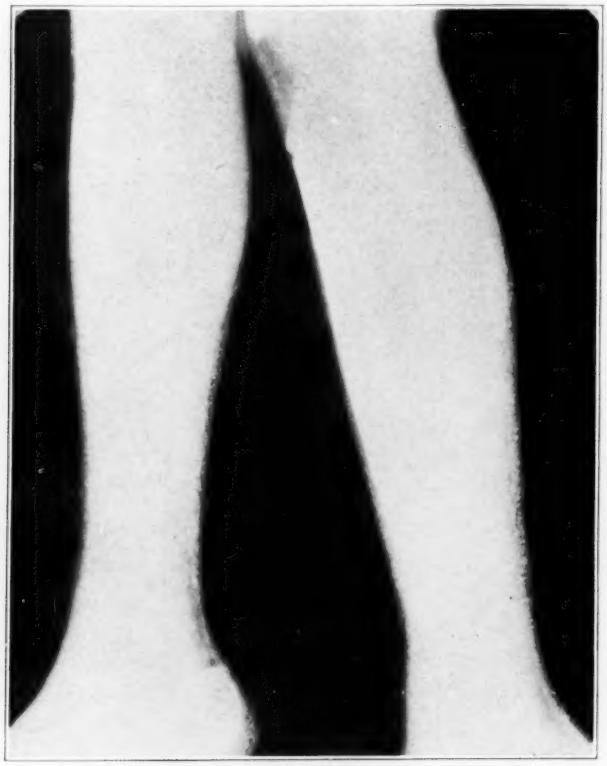

Fig. 2.—Roentgenogram of soft tissues of legs. The picture has been retouched to emphasize the thickening and trabeculation of the soft tissues.

Operation.—Four days after the patient's admission to the hospital, a bilateral operation for hydrocele was performed. Recovery was good; however, thickening of the right vas and, to a less degree, of the left, and some edema of the scrotum persisted for more than a month. A piece of tissue from the tunica vaginalis was examined; it showed some dilatation of tissue spaces in the fibrous tissue, suggestive of edema.

Course.—After rest in bed for about two weeks, the swelling of the legs diminished considerably. When he was dismissed from the hospital, the boy was advised to wear elastic bandages on the legs. He found them uncomfortable and finally refused to wear them. He has returned to school and has resumed athletic activities.

CLINICAL FEATURES

Special Features.—The features in this case which are unusual, or which have not previously been noted, are as follows: (1) the concurrent hydrocele (noted in only two previous cases, those of Boks [1] and van Vliet; [2] (2) the peculiar vasomotor response, which corresponded in intensity with the degree of edema at a given level; (3) the normal basal metabolic rate; (4) the normal response to histamine; (5) the normal results of the salt disappearance test (except on the dorsa of the feet, where a slight deviation from the normal figures is of little significance); (6) the presence of spina bifida occulta; (7) the changes in the soft tissue of the legs, as demonstrated by roentgenograms, resembling those found by Reichert [3] in elephantiasis.

Description.—The disorder consists of enlargement of the soft tissues, but not of the bones, of one or more extremities, usually the lower, associated with a rather firm edema of the affected parts. The enlargement is due mainly to an increase in the subcutaneous tissue unaccompanied, as a rule, by extreme or extensive pathologic changes in the epidermis. A hereditary element is present in a large majority of cases; in Milroy's [4] family, the disorder occurred in seven successive generations. Similar cases have, however, occurred singly. The cases fall into two groups, those in which swelling is present at birth, and those in which swelling appears later. In the second group, enlargement of the extremities is usually first noted late in childhood, at puberty or even during early adult life, but it may occur as early as at 3 months (Hope and French [5]) and at 14 months (Lannois [6]) of age. The peculiar acute attacks, which will be described, occur almost exclusively in cases of the second group.

Historical Review.—Although Milroy assumed that the condition had not been described previously, and it is generally known in this country as Milroy's disease, similar cases had been repeatedly noted in the literature since Hille's [7] report of 1841, in most instances under the

1. Boks, D. B.: Aangeboren familiair oedeem der onderste lemedaten, Nederl. tijdschr. v. geneesk. **1**:416, 1913.

2. van Vliet, J. C.: Angeborenes familiäres Ödem der unteren Gliedmassen, Nederl. tijdschr. v. geneesk. **2**:1092, 1913.

3. Reichert, F. L.: The Recognition of Elephantiasis and of Elephantoid Conditions by Soft Tissue Roentgenograms, Arch. Surg. **20**:543 (April) 1930.

4. Milroy, F. W.: Chronic Hereditary Edema, J. A. M. A. **91**:1172 (Oct. 20) 1928.

5. Hope, W. B., and French, H.: Persistent Hereditary Oedema of the Legs, Quart. J. Med. **1**:312, 1908.

6. Lannois, M.: Une observation de trophoedème chronique héréditaire, Nouv. iconogr. de la Salpêtrière **13**:631, 1900.

7. Hille, J.: Ueber die Elephantiasis, Wchnschr. f. d. ges. Heilk. 1841, pp. 433 and 457, cited by Brandt, G.: Mitt. a. d. Grenzgeb. d. Med. u. Chir. **37**:56, 1923.

name of congenital elephantiasis. Edema, as determined by pitting on pressure, which Milroy believed differentiated his cases from others, had been noted in some of the cases previously reported. Nonne's [8] series of eight cases occurring in three generations, with onset at birth and pitting on pressure, which was reported in 1890, two years before Milroy's first report,[9] seems to be identical in all essential respects with Milroy's. Altogether, including the one mentioned in this paper, about twenty families which have contained two or more affected members have been reported in the literature, and, with one exception, the condition has occurred in two or more generations.

Incidence and Heredity.—In the twenty families of which we have found records there were 133 cases. Because of lack of complete information on the total number of siblings in any of these families it is not possible to give the exact ratio of affected to unaffected members. Several records are, however, reasonably full [10] and are shown in the accompanying table.

Familial Incidence of Milroy's Disease

Author	Number Siblings	Number Affected	Percentage Affected	Number Generations
Nonne	32+	8	25.0	3
Milroy	127+	24	18.9—	7
Hope and French	111+	13	11.7—	5
Van Vliet	41+	13	31.7—	4
Boks	12+	6	50.0—	2
Total	323+	64	19.8—	

In his last report, Milroy (1928) [4] stated that the disorder is dying out in the last generation, since only two new cases have developed since his first study (1892). Bulloch's tabulations show great variations in incidence in different generations. Thus, in the third generation of Milroy's family five sixteenths of the issue were affected; in the fourth, eight thirty-seconds, and in the fifth, five fiftieths. In the Hope and French family there were two main branches descending from two affected children of an affected parent. In the first branch, followed for the ensuing three generations, only one case (in the next generation) occurred among twenty-seven members, while in the second

8. Nonne, M.: Vier Fälle von Elephantiasis congenita hereditaria, Virchows Arch. f. path. Anat. **125**:189, 1890.

9. Milroy, F. W.: An Undescribed Variety of Hereditary Edema, New York M. J. **56**:505 (Nov. 5) 1892.

10. Some of the figures in the accompanying table are derived from W. Bulloch (Chronic Hereditary Trophoedema, University of London, Francis Galton Lab. Nat. Eugenics, Treas. Human Inheritance, 1909, p. 32), who amplified those of the original papers by correspondence with the writers.

branch, three cases occurred in each of the three succeeding generations, which contained twelve, twenty-seven and nineteen members, respectively.

Males and females are affected in about equal numbers. The disorder can be transmitted through either parent, and unaffected parents have transmitted it to their offspring.

Other defects may occur in subjects with the disease and in other members of the family. One of Nonne's series was anencephalic. Hope and French noted dementia, mania, mental deficiency, insanity and epileptiform seizures in various members of the family. A sibling of one of Lortat-Jacob's [11] patients had congenital subluxation of the hip. In Lannois' family there was an epileptic sibling. Gross [12] stated that one of the children of the family died of heart disease, presumably congenital. Cassirer [13] mentioned spina bifida as an accompanying defect and our patient also showed it.

Pathology and Pathogenesis.—Microscopic examination of the affected tissue of the legs has been made only a few times. In Boks' case and our own, tissue from the scrotum showed some increase in connective tissue. Boks also found dilated lymphatics with thickened walls. In our specimen there were some dilated spaces which could not be identified as lymphatics and probably were due to interstitial edema. Stoesser [14] noted merely that "biopsy revealed some fibrosis in the subcutaneous tissue." Susini and Casaubon [15] gave a more detailed description. They noted some changes in the epidermis as well as in the subjacent layers. The epidermis showed a well marked corneal layer, and a malpighian layer which, though thin, was deeply indented and apparently redundant. The dermis consisted of dense fasciculated connective tissue having, just below the malpighian layer, a hyaline appearance and containing islands of smooth muscle and foci of cells (mononuclears, lymphocytes, plasma cells and polymorphonuclears), often perivascular. The fatty panniculus was segmented by dense layers of fibrous tissue, and in occasional places fat atrophy was noted. Similar perivascular cellular foci were seen in the adipose layer. The connective tissue bundles separating the fat vesicles had in various

11. Lortat-Jacob, L.: Deux cas de trophoedème héréditaire chez des enfants, Rev. neurol. **10**:279, 1902.

12. Gross, H.: Die Lymphstauung und ihre Produkte, Deutsche Ztschr. f. Chir. **127**:1, 1914.

13. Cassirer, R., and Hirschfeld: Vasomotorisch-tropische Erkrankungen, in Kraus, F., and Brugsch, T.: Spezielle Pathologie und Therapie, Berlin, Urban und Schwarzenberg, 1924, vol. 10, part 3, p. 689.

14. Stoesser, A. V.: The Hypertrophies of Infancy and Childhood, Am. J. Dis. Child. **35**:885 (May) 1928.

15. Susini, M., and Casaubon, A.: Trofoedema crónico de Meige: Resultados quirúrgicos, Rev. de especialid. **1**:474, 1926.

degrees a hyaline appearance, and between them were circular areas of a hyaline homogeneous substance (dilated lymphatics?).

Biopsies performed by Elterich and Yount [16] in their case of congenital elephantiasis revealed similar changes. They note "extensive fibrosis replacing subcutaneous tissue. Throughout these sections there was a mononuclear perivascular exudate in the affected fatty tissue, with occasional lymphoid follicles. Here and there were large lymphatics filled with a mass of endothelial leucocytes. There was no indication as to the nature of the chronic inflammatory process."

Our roentgen study, made with particular reference to demonstrating changes in the soft tissue, shows quite well the increase in the amount and the depth of the subcutaneous connective tissue; the changes closely resemble those found by Reichert [3] in elephantiasis.

Acute Attacks.—A peculiar but inconstant feature of the disease consists in acute attacks of chills and fever, with hyperemia, swelling and pain of the affected extremities, sometimes closely resembling erysipelas and occasionally described as lymphangitis. These were first noted by Meige [17] in one of his eight cases; later they were noted by Hope and French in a majority of their large series, by Hamman,[18] in both of his; by Brandt,[19] in five of his thirteen cases and by Elterich and Yount, in their isolated (nonfamilial) case. Except in the last instance, acute attacks have been confined to those cases in which the characteristic swelling of the extremities has appeared some time after birth and has not been congenital. It is noteworthy that no acute attacks occurred in Milroy's series, the largest on record, which were all of the congenital type.

The attacks bear a close resemblance to the elephantiasic fever described by Matas in acquired elephantiasis.

Other Complications and Associated Disturbances.—Cyanosis and coldness of the affected extremities, brought on or made worse by exposure to cold, have been noted by several writers and were present in our case. The peculiar vasomotor response to stroking of the skin over the affected extremity noted in our case suggests likewise some disturbance of the sympathetic system or perhaps of the Rouget cells. Varicose veins were noted by Nonne, Tobiesen [20] and Lannois. Brandt stated that in affected women after childbirth the swelling increased,

16. Elterich, T., and Yount, C. C.: Congenital, Elephantiasis, Am. J. Dis. Child. **29**:59 (Jan.) 1925.

17. Meige, H.: Dystrophie oedémateuse héréditaire, Presse méd. 1898, p. 341.

18. Hamman, L.: Milroy's Disease, M. Clin. North America **1**:182, 1917.

19. Brandt.[7]

20. Tobiesen, F.: Ueber Elephantiasis congenita hereditaria, Jahrb. f. Kinderh. **49**:392, 1899.

usually from thrombosis. In one of Sutherland's [21] patients purpura and epistaxis occurred. Herrick [22] mentioned the concurrence of urticaria, intermittent hydrarthrosis, angioneurotic edema and erythromelalgia.

One of Quincke's [23] patients had chylous ascites, showing an abnormality of the abdominal lymphatics post mortem.

In cases reported by Boks, van Vliet and ourselves, hydrocele was present, and in the first two the testis on the affected side was considerably enlarged.

Meige noted hypesthesia of the half of the body on the same side as the affected leg. In general, however, neurologic disturbances are conspicuously absent.

Nature of the Disease.—While Cassirer, Hope and French and others relate the disorder to "trophic" and sympathetic edemas and consider them allied in some way to Quincke's disease, perhaps representing a chronic form of the last, there is little factual support for such a theory. The acute attacks, on which the theory is at least partly based, are marked by fever, redness, pain and other manifestations of acute infection and have been described as erysipelas or lymphangitis by some writers. In appearance and course they closely resemble the acute attacks occurring in acquired elephantiasis, as described by Matas,[24] under the name of elephantiasic fever.

The histologic changes already cited and the roentgenologic evidence of alteration in the amount and the architecture of the subcutaneous connective tissue shown in our case are consistent with elephantiasis. There seems indeed to be no cogent reason why the original designation under which the disorder was described for so many years, that of elephantiasis, should not be continued. The differences between the inborn and acquired forms are of degree rather than of kind. Edema is more easily demonstrated in the hereditary type, probably because of the lesser degree of epidermal change, which constitutes the other main difference between the two types. Thickening of the skin has been described in the congenital form, however, and has even been found histologically (Susini and Casaubon [15]).

The basic cause of the hereditary form is still obscure. The facility with which the affected extremities become cold and cyanotic after exposure, the increased swelling after prolonged standing and the occasional occurrence of varicose veins and thrombosis suggest a disorder of the blood vessels; this opinion is held by Gross.[12] The peculiar

21. Sutherland, G. A.: Two Cases of Congenital Oedema of a Family Type, Proc. Roy. Soc. Med. (Clin. Sect.) **2**:51, 1909.

22. Herrick, W. W.: Hereditary Edema, in Nelson Loose Leaf Living Medicine, New York, T. Nelson & Sons, 1920, vol. 2, p. 648A.

23. Quincke, H.: Ueber fetthaltige Transudate: Hydrops chylosus und Hydrops adiposus, Arch. f. klin. Med. **16**:121, 1875.

24. Matas, R., cited by Reichert.[3]

vasomotor response noted in our case may point to some disturbance of the sympathetic system or of the Rouget cells in the capillaries. That there is a disturbance of the lymphatics in the affected extremities seems likely from the elephantoid character of the tissue changes, but this cannot be regarded as proved. Color is lent to the view by the occurrence of chylous ascites in one of Quincke's cases and perhaps by the occurrence of hydrocele in our cases and in the cases of Boks and of van Vliet. Lymphatic obstruction, if actually present, must be far from complete as compared with that in acquired elephantiasis, since the progressive and often extreme changes in the skin and subcutaneous tissue of the latter are rarely seen in the hereditary form.

Treatment.—Little or no improvement has followed the Kondoleon operation. Elastic stockings sometimes afford the patients comfort, but after a trial our patient refused to wear them. Elevation of the legs at frequent intervals gives considerable relief and seems to be all that is needed in the average case. The acute attacks should be handled as cases of acute infecton with local manifestations.

Nomenclature.—Because the signs of the disorder in a large group of cases fail to appear until late childhood or later, because the defect is so characteristically inherited and because of the nature of the tissue changes, it is suggested that the designation "hereditary elephantiasis" is preferable to such terms as "congenital elephantiasis," "hereditary edema," "trophoedema" and others. "Edema" is a purely symptomatic diagnosis and leaves out of consideration the essential tissue changes of the condition. "Congenital" should be used as a secondary designation for the group in which the swelling is present at birth.[25]

SUMMARY

1. The condition generally known in this country as Milroy's disease appears to be a hereditary form of elephantiasis, showing microscopically and in roentgenograms the characteristic arrangement and increase in subcutaneous connective tissue and also, in a certain proportion of cases, the symptoms of acute infection in the affected extremities described by Matas as characteristic of elephantiasis (elephantiasic fever). The hereditary cases differ from the acquired ones in the presence of a firm edema, a slighter degree of pathologic change in the epidermis and failure to progress beyond moderate limits of severity.

2. The occurrence of local cyanosis after exposure, of an abnormal response to stroking of the skin and of certain other features suggests a concomitant abnormality in the vascular system of the affected extremities.

25. Nonne himself used the term "elephantiasis congenita hereditaria."

3. Two groups of cases can be recognized: (1) those in which swelling is present at birth, and (2) those in which swelling appears in late childhood or early adult life. The acute attacks are practically confined to the second group.

4. "Hereditary elephantiasis" is suggested as a more accurately descriptive term for the disorder. The first group might be designated as "congenital hereditary elephantiasis" and the second, as "late hereditary elephantiasis." "Edema" is not sufficiently inclusive.

CORRECTIONS

In the article by Adolph G. De Sanctis, John A. Killian and Teresa Garcia, entitled "Lactic Acid of Spinal Fluid in Meningitis: Practical Diagnostic and Prognostic Value," which appeared in the August issue (Am. J. Dis. Child. **46**:239, 1933), footnote 5 on page 245 should read: "Brehme, T., and Brahdy, B.: Biochem. Ztschr. **175**:348, 1926."

In the article by Dr. John A. Toomey and Myron H. August, entitled "Poliomyelitis: Comparison Between the Epidemic Peak and the Harvest Peak," which appeared in the August issue (Am. J. Dis. Child. **46**:262, 1933), the months at the bottom of chart 3 on page 269, are incorrectly given. They should read: "June, July, Aug., Sept., Oct., Nov., Dec., Jan., Feb., Mar., Apr., May."

Progress in Pediatrics

MUSCULAR RHEUMATISM IN CHILDHOOD

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The history of rheumatism antedates that of clinical medicine. It is replete with medical superstitions and unfounded interpretations. Only in the last twenty-five years have these superstitions, handed down from ancient and medieval medicine, given way to the attacks of pathology and bacteriology. It was not until the middle of the seventeenth century that Ballonius dissociated the term "rheumatism" from its primitive interpretation. In 1642 he differentiated from acute gout that symptom complex which we now call acute articular rheumatism and restricted the use of the term "rheumatism" to this condition. In the same century, Sydenham, in his "Classical Observations," still further clarified the situation, especially differentiating between gout and rheumatism. From the best evidence that we have been able to obtain, it seems that Cullen was the first person to interest himself in what is now called muscular rheumatism. He is especially known for having fearlessly and uncompromisingly cast aside the current view of the pathology of rheumatism, which during his day was known as a "rheumatic acrimony." Throughout the eighteenth and the early part of the nineteenth century, rheumatism was the diagnostic waste-basket of medicine. All painful involvements of the joints, muscles, tendons and their fascia, most of the visceral conditions and almost all of the obscure infectious diseases of that time were ascribed to rheumatism. Consequently, the literature on the subject of muscular rheumatism abounds with discrepancies, contradictions and much overlapping. The present knowledge of muscular rheumatism is based almost entirely on clinical observations, for the disorder in itself has no fatal tendency, and the opportunity for postmortem examination is seldom afforded. Thus the nature and pathogenesis of so-called muscular rheumatism are still unclear.

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The extreme diversity of interpretation foisted on the vague term "muscular rheumatism" necessitates some attempt at differentiation of the condition from the many symptom complexes which simulate this disease. As examples of the most common synonyms used in medical literature, we find the terms "growing pains," "myalgia," "fibrositis," "myositis," "myofibrositis," *"rheumatische Schwiele,"* "lumbago" and "neuralgia."

DEFINITIONS

Growing Pains.—"Growing pains" is the synonym most commonly used for designating vague recurrent, afebrile muscular pains. The earliest reference that we have been able to find in the literature is that of a study of Duchamp about one hundred years ago. He made the observation that a large number of children during puberty suffer from various muscular aches and pains. He naturally concluded that growth is responsible and thereupon coined the term "growing pains." Others confirmed his observation and agreed with him in his interpretation. It was as late as 1910 that L. T. Brown, an orthopedist, attempted to explain the mechanics of growing pains. He described the disease as follows:

> These symptoms consist chiefly of leg ache and backache, with sometimes very definite and severe pains coming on at night soon after the child has fallen asleep. This usually is relieved by the child's waking and changing its position, or sometimes only after the back and legs have been massaged. This waking is apt to be repeated several times, but if not the sleep is usually of a restless nature. In the morning, on getting up, there is usually stiffness and lameness, which soon passes off, not to return until there has been a rest period of sufficient duration to allow the muscles to stiffen again. Not only is the pain present at night, but it is brought on by long standing or sitting in one position. With these symptoms it is natural that such children tire more easily than normally, and they, therefore, can only with difficulty keep up to their mates either in school or at play.

In explanation of the pathogenesis of this symptom complex, he further wrote:

> During the day the muscles and the ligaments holding the sacrum in place are in a constant state of contraction, and the only symptoms are that the child gets more easily tired than other children and that he cannot run and jump as well as his companions; at night, when sleep relaxes these muscles and ligaments, the sacrum may move or sag and in so doing strain or irritate the joints, and this irritation may be transmitted to the lumbosacral cord or the sacral plexus and cause the child to wake with pains in his legs or back; on waking, the position is changed, the muscles contract, the joints are protected and the child goes to sleep again, the condition to be repeated with more or less frequency during the night.

In conclusion, he said:

> . . . strained or relaxed sacro-iliac joints may be a marked factor in causing "growing pains" in children.

The author of this article confuses growth, asthenia and visceroptosis. The cases which he presents in his study are of abnormal children. He does not prove his contention that physiologic growth is the cause of muscular pains.

G. Stanley Hall, the great psychologist, was a strong advocate of this theory. In his book, "Adolescence," written in 1908, he stated:

> . . . There are two kinds of so-called growing pains: first, that located in the epiphyses and growing centres of the bones, which are supplied with nerves and may become the seats of inflammation. These pains may seem seated in the bones, limbs and perhaps most often near the neck of the femur and the tibia although almost no part of the body is entirely exempt from them. Adolescent tarsalgia and artralgia have been described. The rapid bone growth following fever may be attended with painful though mild osteitis, periostitis, especially in boys between 11 and 22. Secondly, the bones may grow faster than the muscles or the skin; the latter then suffer from abnormal tension and are stretched and perhaps bloodless, especially in the thighs. This too is often acutely painful.

He furnished no authentic source for these statements.

Although the influence of Duchamp has waned as regards the theory of the nature of growing pains, the term is still used quite generally in preference to any other. In this country Jacobi gave the theory of growing pains the strongest blow when, in 1884, he announced that these vague, ambiguous pains in children are probably associated with rheumatism. He clearly saw the clinical relationship between growing pains and articular rheumatism and even endocarditis. He noted that uncomplicated muscular rheumatism is very rare in young children, and at that time he wrote as follows:

> . . . "growing pains" are not infrequently inflammatory rheumatism, and endocarditis of later years may be traced back to the growing pains which are but dimly remembered.

Chronic Fibrositis or Myofibrositis.—Although the terms "fibrositis" and "myofibrositis" are not used in pediatric literature, they are rather commonly referred to in the general medical literature. As early as 1871, Helleday described infiltrations in the muscles in association with chronic rheumatism. These infiltrations he was able to palpate as small nodules in the muscles, and he found them very sensitive to pressure. Apparently, for the same group of disorders to which Helleday referred as chronic myositis or nodular rheumatism Rosenbach used the term "functional myopathia;" Goldsheider labeled these conditions "refrigeratory myalgia and arthralgia," and Luff spoke of them as fibrositis.

The term "fibrositis" was first used by Sir William Gowers in 1904. To him it meant an actual pathologic change in the muscle or group of muscles involved. What are now labeled "wry neck," "lum-

bago" and "pleurodynia" were at that time diagnosed as rheumatic fibrositis. He said, in brief:

> . . . the essential change is an inflammatory hyperplasia of white fibrous tissues. The new tissue contains numerous fibroblasts, its vessels and nerves are chronically inflamed, and there is sero-fibrinous exudation into its interstices; it is swollen, painful, and tender on pressure. The patches of inflamed tissue may resolve and disappear, or they may spread, become more fibrous and contract. These indurations may be circumscribed as nodules, may form thickened bands (as in Dupuytren's contraction of the palmar fascia), or may form large areas of thickened, brawny, inelastic tissue with, here and there, more prominent and painful spots. Histologically, they show, in the early stages, a serofibrinous exudate, blood vessels with thickened walls and nerve fibrils interstitially inflamed; and in more chronic and advanced cases a more definitely fibrous structure, the interstices of which have practically disappeared.

Muscular Rheumatism.—It was not until about 1910 that systematic attempts were made to separate muscular rheumatism from all other conditions which simulated it. Schmidt was probably the first to study comprehensively all phases of the subject. His large experience included the study of animals as well as of human beings. He came to the conclusion that this condition is not really myositis; that there are no characteristic visible or palpable changes to be found in the muscles or elsewhere in the body.

A more recent explanation of the changes occurring in muscular rheumatism is that given by Rosenow. In 1900, he first produced actual inflammatory myositis by inoculating the muscles of rabbits with what he has called "the streptococcus rheumaticus." In this way he was able to produce lesions which consisted of tender red swellings, which sometimes progressed into abscesses. In these same animals infections of the blood stream developed and also vegetations on the valves of the heart similar to those of rheumatism in man.

Also both in the muscles of human adults suffering with chronic rheumatism and in the muscles of animals which had been exposed to experimental infection through the peritoneum, he found:

> . . . a coagulation necrosis of muscular fibres, elongated lesions running parallel with the fibres, containing few leucocytes but large numbers of living cocci. The first stage is a small hemorrhage; then the muscle fibres at this site lose their striation, stain poorly, become granular and break up into fragments, with leucocytic infiltration and great numbers of organisms. These lesions, in animal experimentation, are most numerous in the tendinous portions of muscles of the extremities, the flat muscles about the neck and shoulders, the intercostals and muscles of the spine, corresponding with the clinical types of muscular rheumatism most often observed.

In a later paper Rosenow strongly reemphasized the infective origin of myositis. He and Ashby reported the results of a detailed study on 28 adults. Of these, 24 had septic foci in teeth or tonsils, and

improved greatly after the foci had been suitably treated. The organisms found in the foci produced lesions in animals similar to those in the patient from which they had been isolated. In a case in which there was no improvement in the muscle condition after the suspected foci had been treated, the organism derived from the area of infection failed to produce muscular lesions in the animal into which they were injected. These observers succeeded in isolating anaerobic streptococci from muscular lesions in both man and animals. Control cultures from the blood of these subjects were often sterile at the same time that cultures from the muscles were positive. The strains of organisms from patients with generalized myositis tended to produce numerous small lesions in animals; those from localized myositis produced only a few localized muscular lesions in animals. Of rabbits given injections of pus from the tonsils of patients with myositis, 94 per cent subsequently presented lesions in the muscles; of rabbits given injections of pus from the tonsils of patients who were not subject to myositis, only 12.5 per cent later showed muscular lesions. The changes which Rosenow and Ashby described in human muscles in the acute stages were:

> . . . extravasation of red cells, interstitial swelling, swelling of muscle fibres, with necrosis and disappearance of transverse striation. Streptococci can be found on direct examination. In the chronic stage there is marked endothelial swelling and plugging of vessels, and little cellular infiltration; streptococci can be found only with great difficulty, but they can be cultured from the area of the lesion.

From both experimental and clinical evidence it would seem that muscular rheumatism or chronic fibrositis as it is described in the foregoing literature belongs to a group of conditions of muscular hyperalgesia which may result from infections, toxemias, overexertion and exposure to cold. The chief complaints may appear in the form of myalgia, neuralgia or arthralgia. The migrating nature of the pain is still unclear. Whether or not the disease is always associated with histologic changes remains to be determined.

PURPOSE AND TECHNIC OF OUR INVESTIGATION

Because the present knowledge of chronic myalgia is obscure, because there is still such a confusion of terms and because of the meagerness of carefully controlled studies over a long period of time of a large number of children suffering from this disorder, we have undertaken during the last two years to make a combined statistical and clinical study of it. First, by a questionnaire, we studied the incidence of the subjective complaint of a duration of more than three months. The reliability of this questionnaire we have already determined. The similarity was 84 per cent in the younger and 95 per cent in the older group. Of 208 children thus questioned, 21 per cent answered that they had muscular pains of one kind or another lasting more than three months.

The relation of these pains to the health habits of the patients and to other functional disorders was also studied. We cannot be sure of the etiologic diagnosis of the muscular pains in this group because we did not follow the progress of the patients over a sufficiently long period of time. We are statistically certain, however, of the reliability of the answers as to muscular pain. We next studied a smaller group of 35 children over a period of two years; we saw them repeatedly in the outpatient department and in the home. The data which we present in this paper as our own refer to the information gathered from the latter group.

INCIDENCE ACCORDING TO AGE

The differences in percentage incidence of this disorder obtained by different observers depend first on the differences in the definition of the term used; secondly, on the climate and latitude at which the data

TABLE 1.—*Percentage Incidence of Growing Pains in 208 Children*

Age Group. Years	Percentage of Group Who Had Growing Pains	
	Male	Female
7	2.1	2.1
8	0	2.1
9	12.8	2.1
10	12.8	4.2
11	4.2	0
12	15.0	15.0
13	8.5	6.4
14	4.2	6.4
15	2.1	0

were obtained, and thirdly, on the thoroughness with which the questionnaire was prepared.

In a careful study in 1929, May Wilson found that of all the children admitted to her clinic for cardiac diseases over a period of about seven years 20 per cent suffered from growing pains with or without other rheumatic symptoms. In a study of English school children, in 1928, Williams found an incidence of growing pains of between 44 and 50 per cent in children between 8 and 10 years of age, the higher incidence being in the rural children; of from 39 to 43 per cent in children from 10 to 12 years of age, and of from 21 to 28 per cent in children of 12 years and over. In questionnaire 1, ten questions for information on growing pains were inserted. These questions were asked twice of each child. Of the 208 children to whom questionnaires were given, 47 gave answers that they had growing pains (14.5 per cent of these were from the boys, and 8.6 per cent from the girls). It can be seen in the table that the majority were in the period from 9 to 14 years inclusive. The condition does not occur more frequently during puberty than during the earlier years of childhood (table 1).

In going further, we found that there was a definite relationship between "growing pains" and inadequate sleep (table 2). Of all the children who had adequate sleep, only 15 per cent suffered from growing pains, whereas 34 per cent of those having inadequate sleep had growing pains. By the use of Pearl's scale it was calculated that the chances against these differences being an error of random sampling are 825:1. We also find in table 3 a significant relationship between growing pains and fatigue. Among the children who complained of subjective fatigue 24 per cent also complained of growing pains whereas only 6 per cent of those in whom fatigue was absent complained of growing pains. The chances against the difference being an error of random sampling

TABLE 2.—*The Relationship Between Sleep, on the One Hand, and Growing Pains and Headache, on the Other*

	Growing Pains				Headache			
	Present		Absent		Present		Absent	
Sleep	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
Adequate	25	15	138	85	53	32	109	78
Inadequate	33	34	64	66	47	68	51	32

TABLE 3.—*The Relationship Between Fatigue and Growing Pains*

	Growing Pains			
	Absent		Present	
Fatigue	No. of Cases	Per Cent	No. of Cases	Per Cent
Absent	140	53	16	6
Present	64	24	64	24

are 400,000:1 (Pearl's scale). Such a figure is highly positive. We do not mean to imply that the relationship is causal. We do not know that the fatigue is the cause of the muscular pains, nor do we claim that the pains are the cause of the fatigue. Neither can we from this study argue that the pains may cause inadequate sleep. However, the relationships as seen in the previous two tables exist and represent important information as to the etiology of this disorder.

In the smaller group of 35 children who were studied more intensively we found that the age of onset differed considerably from the age of admission to the clinic. This does not represent a true incidence for all children, because this particular group was limited to the very poor—those who visited the outpatient clinics and attended schools in the poor districts. Nor does the group represent a fair sampling of all races, since 85 per cent of the group were children of immigrant parents (Italians, Jews and Swedes) and Negroes.

In this smaller group we find a rather high incidence of the onset of the disease before 6 years of age. Of the 35, 5 experienced the onset at 2 years, 2 at 3 years, 4 at 4 years and 9 at 5 years, 59 per cent of all the patients having had the onset before 6 years of age. On the other hand, only 9 (26 per cent) of this smaller group were admitted to our clinic at or before 6 years of age. As can be seen, the majority of the children admitted to the clinic were between the ages of 6 and 10 inclusive. This means one thing definitely; namely, that mothers take these "growing pains" for granted and wait a long time before they seek advice from the physician.

DIAGNOSTIC SIGNS IN MUSCULAR RHEUMATISM

Fever.—It might be expected that fever would be an important diagnostic sign in the differentiation between muscular rheumatism and all other conditions that simulate it. However, since the fever that occurs in subacute and chronic rheumatism is known to be low and

TABLE 4.—*Comparison of Temperature, Hemoglobin Content and White Blood Cell Count in Normal Persons and Patients with Muscular Rheumatism*

Group	Subjects	Percentage with Given Temperature		Percentage with Given Hemoglobin Content		Percentage with Given White Blood Count	
		97-99	99+	60-80	80+	−8,000	8,000+
Normal	50	69	31	10	90	21	79
Muscular rheumatism	35	68	32	26	74	36	64

variable, alternating with periods of normal temperature, it is important first of all to decide under what conditions an elevation of temperature is of pathologic significance. Moreover, since the temperature in normal children is variable and is influenced by such factors as food, exercise, general health and possibly psychologic stimuli, we first studied a group of normal children under known conditions of environment and health. This group consisted of 50 children from 5 to 14 years of age whose tonsils had been removed two weeks previously but who otherwise were free from disease. The average temperature taken by mouth was 98.2 F. with a variation of from 97 to 99.9 F. Table 4 shows the difference between the temperature of the normal and that of the abnormal group. If we use 99 F. as a limit of normal variation, we find 31 per cent of the patients in the normal group having fever, as compared with 32 per cent in the abnormal group. If we use 99.5 F. as the limit of normal variation, there is a difference of 4 per cent in favor of the latter group. In either instance the difference is insignificant.

Relationship of Fever to Hemoglobin and White Blood Count: The question naturally arises as to what should be considered a normal zone for the hemoglobin and white blood cell count. As indicated in table 4,

we have attempted to compare the hemoglobin readings and the leukocyte counts in this group of 50 normal children with those obtained in the group of 35 children affected with growing pains. Our mean percentage of hemoglobin was 82; 26 per cent of the patients in our abnormal group had hemoglobin percentages below 80, as compared with 10 per cent of the normal group. Strange as it may seem, 79 per cent of the normal children and only 64 per cent of the abnormal ones showed a leukocyte count of over 8,000. Whether we used 7,500 or 8,000 as a mean, we found no significant difference between the normal and abnormal groups in the relationship between fever and the leukocyte count. The examinations of the blood were made by various technicians in the hurry of an overcrowded outpatient department, and were not repeated often enough for us to be sure of the reliability of the findings. Therefore we do not want to commit ourselves as to the practical significance of these figures.

Fever and Weight-Height Index: A weight-height index (Holt-Woodbury tables) which was more than 7 per cent below the normal was considered abnormal. A repeated or continuous temperature of 99.5 or over by mouth was considered fever. We found that 45 per cent of the 9 children who had fever had a low weight-height index, and that 50 per cent of the remaining 24 who had no fever had a similarly low index. These figures indicate that there is no significant relationship between fever and a low height-weight index. This is contrary to what one would expect.

Fever and Murmur: We were also interested to see whether the children who had continuous elevations of temperature acquired heart murmurs more frequently than the others. In 30 per cent of the 10 children who had fever, constant systolic murmurs were heard, whereas murmurs developed in only 19 per cent of the 26 who were afebrile. Although the difference in the percentage incidence is suggestive, the total number was too small to allow one to draw conclusions.

Fever and Sinus Disease: All of the children were subjected to roentgen examination, with special reference to the maxillary sinuses. We found no relationship between fever and the roentgen diagnosis of chronic sinusitis. None of the children were operated on, so that we were unable to compare the surgical with the roentgen diagnosis.

Fever and General Health: In chronic rheumatism it is to be expected that the general health will be affected. The general health was judged by the appearance of the child, the color, the general efficiency and the attendance at school. One hundred per cent of the children with fever were considered to have poor general health, while 81 per cent of those with no fever showed poor health. All that can be said from this small sample is that children suffering from chronic

rheumatism are extremely liable to poor health, and that poor health is even more frequently present when fever is present.

Pulse.—What was said regarding the fever as a diagnostic index may also be said regarding the pulse. The pulse rate is variable in growing children and is very sensitive to external influences. An important question and at the same time a most difficult one to answer is: What constitutes a normal pulse rate? Also what is the limit of the normal variation? In an outpatient department it is almost impossible to depend on the pulse rate as a reliable index of the state of health. We have attempted to study the pulse rate in the homes under the most suitable psychologic conditions, but our results have been unsatisfactory. In attempting to correlate the pulse with the temperature, we found no positive relationship. The reason for this is probably an error in technic.

Schlesinger overcame the psychologic difficulties of interpreting the pulse rate by taking it during sleep. He observed that the pulse rate in healthy children showed a fairly constant drop during sleep, but that if the patients were disturbed and half awakened while the pulse was being taken, the rate rose to a level even higher that that recorded during the waking hours of the day. He claimed to have demonstrated conclusively that with obvious active carditis the sleeping pulse rate is raised. In children with subacute and quiescent rheumatism as well as rheumatic heart disease he found the pulse rate during sleep to be on an average 10 beats higher than in normal children. The care with which this study was made, and the practical value of such a simple procedure justify the taking of the pulse during sleep in all children suspected of having rheumatism.

The Blood.—There has been considerable study of the leukocyte index in all forms of rheumatism except the muscular. It is well known that in acute articular rheumatism a leukocytosis with a polymorphonuclear increase is quite constant. After a careful study of 35 cases of articular rheumatism, Swift considered a leukocytosis to be an index of the activity of the disease. He wrote:

> In comparing the clinical symptoms and the leucocyte curves in a fairly large series of patients we have found that in the majority of instances these curves have considerable value. It is true that they have no greater absolute value than any other sign in clinical medicine, and that they are of most use when taken together with other features of the disease. But, in general, it may be stated that in the absence of evidence of concomitant nonrheumatic infection, a persisting leucocytosis signified persistence of rheumatic infection, and, conversely, that repeated normal counts indicated that the attack was drawing to a close.

In 1926, May Wilson made a careful study of 88 children with rheumatism. She studied four groups: (1) those with acute and subacute rheumatic fever, (2) those with chorea, (3) those with recurrent grow-

ing pains and pains in the joints and (4) those with rheumatic heart disease. She found that the average count for those with potential heart disease was 7,000 cells; for those with organic heart disease fully compensated, 7,700 cells, and for children with an active rheumatic infection (carditis, arthritis, chorea and recurrent growing pains and pains in the joints) above 9,000 cells. From these data she draws the conclusion that a leukocyte count within the normal range (up to 9,000) may be considered as indicative of quiescence of the rheumatic infection. Counts above the normal range are indicative of activity of the infection.

In 1929, Perry found (1) that in acute rheumatic carditis a slight leukocytosis (from 12,000 to 15,000) is present; (2) that in subacute infections there is a varying and less constant leukocytosis; (3) that an eosinophilia occurs in chorea, and (4) that the leukocyte count is not of value as an index of activity in rheumatic heart disease. Much work has recently been done which suggests that a high eosinophilia is constantly present in muscular rheumatism. Bittorf found an increase of eosinophils in severe acute articular rheumatism of from 6.5 to 16 per cent, with an average of 9 per cent. Staeckert observed an increase of eosinophils to the extent of 6 per cent in muscular rheumatism. He believed that this fact was of help in differentiating between muscular rheumatism and neuralgia. Both these observers held that this eosinophilia indicates the existence of bacterial toxins. Kaufman also found an increase in acute cases, but he did not think that it was of significance in muscular rheumatism. He said that in many cases of muscular rheumatism he found a normal eosinophil count. Swift found an eosinophilia only in chorea and erythema multiforme. He has been unable to confirm the aforementioned findings in any other forms of rheumatism.

Of late there has been an attempt to study quantitatively the chemistry of the blood in rheumatism in the hope that it may give some objective information as to the presence of activity. Chadwick entertained the belief that active rheumatism with or without heart disease is accompanied by an abnormal blood sugar after the injection of levulose. He injected levulose into 19 children who were suffering from rheumatic fever with definite cardiac involvements, and only 3 showed a rise of more than 30 per cent in the blood sugar. Of 5 children who had active chorea without cardiac involvement 2 showed a rise in the blood sugar content of more than 30 per cent after the injection of levulose, and of 12 who had active chorea with organic heart diseases 2 showed an abnormal rise of blood sugar after the injection of levulose. Only 4 (12 per cent) of 32 patients with rheumatic heart disease showed an abnormal rise after the injection of levulose, whereas 3, or 33 per cent, of 9 who had articular rheumatism without heart disease showed an increase in the blood sugar of more

than 30 per cent. From these data Chadwick drew the conclusion that the levulose test gives no consistent evidence of the derangement of the liver in rheumatism.

Heart Disease.—It has long been agreed that rheumatism and heart disease are frequently associated. In writing of growing pains, in 1884, Jacobi observed that without any other known cause rheumatic heart disease may be found in association with growing pains. In more recent years the English writers have gone so far as to say that from 10 to 20 per cent of rheumatic heart disease is associated with no other etiologic factors. Findley stated that in 77 of 701 cases of rheumatism the rheumatic manifestations previous to the cardiac manifestation had been of the nature of growing pains alone. Since the question as to whether growing pains are insignificant or are rather frequently associated with rheumatic heart disease is still a mooted one, it is well at this time to insert the brief records of 4 children with rheumatic heart disease whose only symptom of etiologic importance, as far as could be ascertained, was growing pains.

Case 1.—D. K., aged 9 years, had a history of continuous pains over the entire body, especially the ankles, knees, thighs and calves, since the age of 1 year. There was a suspicion of redness of the knee, but there was no definite history of articular rheumatism. The child was 13 per cent underweight. The roentgenograms of the sinuses were negative. The tonsils had been removed in 1927. There was a history of rheumatism in the family. The mother had mitral disease; a sister had died in 1931 of rheumatic heart disease; a brother, aged 18, suffered from mitral disease as the result of articular rheumatism, and the grandmother before her death had had "heart disease" for many years. The electrocardiogram was normal, there was no leukocytosis, and the streptococcic agglutination titer was 1:3,200. The clinical diagnosis was double mitral disease.

Case 2.—F. F., a boy, aged 9 years, had been suffering from pains in the thighs, calves, ankles and knees for a period of five years. There had been no swelling or redness, but the patient had had a fever more or less continuously for over a year. The white blood count averaged about 13,000. The patient was 8 per cent below weight. The roentgenograms of the sinuses revealed nothing abnormal. The tonsils had been removed in 1928. There was no history of rheumatism in the family. The streptococcic agglutination titer was 1:800. The clinical diagnosis was double mitral disease, although the roentgenographic findings of the heart were unimportant.

Case 3.—S. L., a boy, aged 11 years, had been having pains in the ankles, shoulders, calves and thighs for two years. There had been no swelling or redness. The patient's sister had had an attack of articular rheumatism, and his stepfather had also suffered from articular rheumatism since his marriage. There had been no fever and no leukocytosis. The weight-height index was normal. The roentgenograms of the sinuses showed nothing of significance; the tonsils were not diseased. The streptococcic agglutination titer was 1:200. The roentgen diagnosis was "mitral heart." The clinical diagnosis was the same, both systolic and presystolic murmurs being heard.

CASE 4.—C. G., a boy, aged 5 years, had had a pain in the calves, ankles and knees for one year. There was no history of rheumatism of any form in the family. The electrocardiogram showed a low Q R S in lead three. There was a slight leukocytosis, but no fever. The child was 16 per cent underweight. The roentgenograms of the sinuses were negative. The tonsils had not been removed. The streptococcic agglutination titer was 1:1,600. The roentgen diagnosis was fulness of the left ventricle, with slight enlargement. The clinical diagnosis was mitral regurgitation.

A review of the 4 cases presented may leave the reader in doubt as to what we consider are the differences between articular and muscular rheumatism. There are very few instances of muscular pains without associated pains in the joints. All of the 4 children had pains in the joints as well as muscular pains. The patient in case 1 had pain in the ankles and the knees, with a suspicion of redness of one knee. However, we did not include in this group any children who had a history of acute inflammatory rheumatism with fever. Another question which these cases suggest is that of the incidence of heart disease in children with "muscular pains." It is difficult to secure an accurate estimation of the incidence of growing pains in the general population because of the differences in the interpretation of this disorder. If a survey is made by the questionnaire method and no other confirmatory evidence is sought, many cases other than rheumatism will be included. In a careful analysis of 48,000 school children, by questionnaire, Kaiser obtained positive answers indicating experience of growing pains in 7.1 per cent. In a more closely controlled group of 4,400 children, 8.4 per cent gave histories of having growing pains. Other statistics range as high as 44 per cent (Williams). The group which we have presented is not a cross-section of the general population, because these children were selected from a rheumatic environment and for admission to the clinic for cardiac diseases. We therefore cannot expect the same incidence of heart disease in this supposedly rheumatic group as in the general population. Eleven per cent is, to be sure, a high proportion of heart disease in such an apparently mild form of "rheumatism" but whether this small number represents a fair sample or not, the fact remains that organic heart disease may and does result from the condition represented in these chronic muscular pains.

Pain.—Pain is the most prominent symptom of this condition, yet practically no studies have been made of it in connection with this particular disorder. Are these pains produced by the irritation of the nerve endings, from the bacterial toxins, or are they due to the actual lodgment of the organisms themselves in the capillaries and tissue spaces? This is a point of academic interest which has elicited many different opinions. Schade entertained the belief that in muscular rheumatism the pain in the muscles is the result of colloidal changes.

Schmidt explained the pain in this condition by a theory that because of circulatory disturbances in the muscles there is a deficiency of oxygen; this increases the toxins of fatigue, the effect of which manifests itself in the fatigued muscles as a sensation of pain. Goldscheider, on the other hand, applying the conclusions of an experimental study, considered that this myalgia is due to a general hyperalgesia which affects not only the muscles but also the deep tissues, the bones, the joints and the nerves. Nowhere in the literature, however, have we read an explanation which states that muscular rheumatism has an infectious basis.

Distribution and Duration of Pain: Attempts have been made to diagnose muscular rheumatism on the basis of the location and the type of the pain. At the beginning of our study, we included all cases of muscular pain. We discarded conditions, such as flat feet, scoliosis and traumatic synovitis, which did not fit into the entity of the group selected for study. The patients in the group that we present in this paper are clinically similar, and we therefore feel justified in presenting them all under one classification. The characteristics of the pain are as follows: First, no single case was of shorter duration than three months. Twenty per cent of the patients had complained of pain for from three to six months before admission; 22 per cent, from six to twelve months; 22 per cent, between one and two years; 14 per cent, between two and three years, and 22 per cent, three years and over. As to distribution, in only 7 children was the pain limited to one muscle or one group of muscles. In the remainder the contiguous joint was involved. In the order of the frequency of their involvement, these were the combinations: (1) calves and knees, (2) thighs and knees, (3) calves and ankles, and (4) wrists and arms. The least frequently involved were the shoulders, the abdomen, the legs, the sacro-iliac muscles and the fingers.

Tonsils and Growing Pains.—There was a time when the tonsils were considered to be of primal importance in the causation of rheumatism. The evidence which has been accumulated on this subject, however, has been shaking that point of view. There has been such a large amount of material collected that it would not be to the point to attempt to incorporate it all in this paper. However, a brief discussion of several of the most recent papers on this question will be of interest. In a careful study by the British Medical Research Council in 1927, it was found that a complete removal of the tonsils does not appear to afford absolute protection from an attack of rheumatism. For example, among 907 rheumatic members of rheumatic families, 295 or 32.5 per cent had had tonsillectomies. In 43.7 per cent of these rheumatism developed at some time after the operation.

An equally important statistical study of this kind representing the situation in America is that of Kaiser. He believes that growing pains are mild manifestations of rheumatic infection. In 4,400 children he found that growing pains occurred with equal frequency before the sixth year of age in the patients operated on and those not operated on. During the school age, 172 tonsillectomized children, or 7.8 per cent, were subject to this complaint, while 200, or 9 per cent, of nontonsillectomized children were having growing pains. Evidence of carditis was detected in 16 per cent of the children subject to growing pains in whom the tonsils had not been removed and in 18 per cent of the children whose growing pains manifested themselves for the first time after the tonsils were removed.

Kaiser stated:

> The milder manifestations of rheumatism known as "growing pains" seem to be less influenced than is rheumatic fever by the absence of tonsils. It occurs somewhat less frequently in tonsillectomized children, but carditis is as likely to follow this mild rheumatic infection after the tonsils are removed.

Although our experience in this matter is limited to a much smaller number than that quoted, we studied the question thoroughly over a long period of time. Fifty per cent of our group gave a history of having had their first attack after the removal of tonsils, and although there seemed to be a temporary improvement in a smaller number after tonsillectomy, this procedure did not result in a greater decrease of the frequency of recurrences than in the children in whom the tonsils remained.

Sinuses and Growing Pains.—During the last decade, a great deal of attention has been directed to the sinuses, especially the maxillary, as a possible focus for the development of endocarditis, articular rheumatism and even muscular rheumatism. It has been our opportunity to study a larger number of children who have been treated for chronic sinus disease, and we have taken especial pains to study them in relation to rheumatism. We have made it a routine to take roentgenograms of the sinuses of all the children in whom rheumatism of any form was suspected. Many of these patients were operated on. It is unnecessary at this time to give a detailed statistical analysis of our results. However, in this small group of 35 children we found no causal relationship between pathologic sinuses as evidenced by roentgenograms and growing pains. Moreover, the few children who in our private practice were operated on showed no improvement in their growing pains.

Familial Incidence and Contagion.—The theory of heredity as a predisposing factor in rheumatism has held sway for many years, but in the last decade a large amount of evidence has been accumulated to shake that theory. There is no question that the disease has a tendency

to occur in certain families, and many investigators, among whom are St. Lawrence, May Wilson and the Medical Research Council, have found a high incidence of more than one case in families afflicted with rheumatism of one form or another. In 1922, St. Lawrence made a careful investigation of the familial incidence of cardiac disease, acute rheumatic fever and chorea in 100 families. Although his study does not give us any direct information on this point regarding muscular rheumatism, the frequent association of all these conditions makes it reasonable to suppose that what is true of the former is also true of the latter. St. Lawrence found that rheumatic children attending his clinic often had brothers or sisters with the same malady, and that in 50 per cent, two or more members of the same family were affected. In 22 families heart disease was discovered in 2 members; in 5 families, in 3 members, and in 2, in as many as 4 members. He found that the incidence of heart disease in the general population was from 1 to 3 per cent, whereas in the 480 people who had been living in contact with rheumatic infection it was as high as 8 per cent. He concluded from his data that if one person is found to have a rheumatic manifestation, there is one chance in two that at least another member will be found to have been affected by a similar disease. Moreover, he observed that what we call growing pains were exceedingly common in the children of this group, far more common than would appear in the general population. Still, in summarizing the work of the Medical Research Council, came to the following conclusions:

> There is a significant difference between the incidence of rheumatism among the living members of the families of rheumatic children as compared with those of the control series. The per cent of rheumatic persons among the relatives of the rheumatic patients was found to be 6.0 ± 0.7 and 11.8 ± 0.7 at the Royal Hospital for Sick Children, Glasgow, and St. Thomas's Hospital respectively, whereas among the relations of the nonrheumatic patients there was found only 2.5 ± 0.7 and 6.2 ± 1.1 per cent of rheumatic relations. There was found to be clear evidence of family incidence; rheumatism was common in the parents or brothers and sisters of the rheumatic child. This might indicate inheritance of the disease or of some special tendency to the disease; but, on the other hand, it might be due to similarity of environment, or again it might be due to contagion.

To quote still further:

> No sufficient evidence of heredity was forthcoming. A history of rheumatism in grandparents can seldom be verified; parental rheumatism can be ascertained with a nearer approach to accuracy. Careful inquiry showed that rheumatism had occurred in the father or mother in about 20 per cent of the rheumatic families; but in the control families there was also parental rheumatism, less indeed but still in one set of figures as high as 17 per cent, in another 11 per cent, so that it may be doubted whether the excess of parental rheumatism is sufficient indication of heredity.
>
> The frequency of rheumatism in residential schools is difficult to reconcile with heredity of the disease, for there is no reason to suppose that if family histories

were available in these cases (they are not obtainable in some and not reliable in others) parental rheumatism would be found to be any less frequent than in the case of the central families investigated at hospitals. If parental rheumatism were an indication of heredity, and heredity played any considerable part in determining the incidence of rheumatism, rheumatism might be expected to be slightly, if at all, less frequent in these children in the Poor Law Schools than in those outside. Their comparative immunity supports the idea that a high standard of food, clothing, housing and general care does much to prevent the disease: it is, however, a possibility that the comparatively sequestered life of these children, in a community which has much less contact with the outside world than the ordinary child has, may involve less risk of exposure to infection. This view would assume that rheumatism may be conveyed by contagion.

Still suggests from this study that rheumatism is communicable, and that close contact over long periods of time between the diseased and the exposed susceptible person is an important means of transmission. Although our own series was small compared with those just discussed, nevertheless the frequency of more than one case of rheumatism in the families of the children whom we questioned was quite noticeable. In 1 family all 5 members were affected; in 3 families, 3 members had been attacked; in 4, 4 members in addition to the patient admitted having had some form of rheumatism other than growing pains, and in 13 families, 2 had had, or were still suffering from, this disease. Among the 35 families of these children, 70 people were affected. In 1 family the stepfather suffered an attack of acute rheumatism after his marriage into the family.

Objective Study of Muscles.—It would be of great help in the diagnosis if one could find clinicopathologic changes in the muscles themselves. On this point there is a great deal of debate. The early writers who first discovered and attempted to classify the conditions known as chronic fibrositis or myositis claimed to have found such objective changes in the muscles and in the skin. They spoke of the heat of the skin and the hypertonicity of the involved muscles, and a number of them claimed to have found definite indurated masses. From a reading of the literature it is difficult to be certain whether the masses described are really pathologic changes in the muscles themselves or whether they are the well known rheumatic nodules which are pathognomonic of rheumatism. In the examination of our 35 children, we were unable to find any visible or palpable lesions of the skin or the muscles such as have just been mentioned. We do not know whether our technic of examination was inadequate or whether this disease is dissimilar from the fibrositis and myositis of the adult. In only 1 case were we able to find a rheumatic nodule, in that of a child who also had endocarditis. Another claim of the older writers which we were unable to confirm was that the muscles most frequently involved in this condition are usually the superficial and the least used, such as the trapezius and the pectoral. Our experience was just the opposite.

The Electrocardiogram.—In 1928 and 1929, Swift, Cohen, Libman and others discovered by means of the electrocardiograph an absent isoelectric period in from 80 to 85 per cent of adults suffering from acute articular rheumatism. They took this to signify myocardial damage. The only similar study in quiescent, or inactive, rheumatism was that by Shapiro. He took repeated tracings of 119 children of school age, who had had an attack of rheumatic fever within three years of admission to a clinic. He stated that he found prolonged P R intervals, notching of the Q R S complex and an absence of the isoelectric period in lead II, all of which are supposed to indicate myocardial damage. In our series, which was limited to children with chronic muscular pains and pains in the joints unassociated with other forms of rheumatism, we found no such changes.

TABLE 5.—*Sedimentation Rate (Cutler's Method)*

Group	Subjects	Percentage with Given Rate of Sedimentation				Average No. Mm.
		1-5 Mm.	6-10 Mm.	11-15 Mm.	16+ Mm.	
Normal	12	50	33	17	0	5.9
Rheumatic fever	20	30	30	15	25	10.0
Muscular rheumatism	10	10	30	20	20	8.7
Chorea	6	30	30	16	24	11.0

Sedimentation Test.—Since 1917 and 1920, through the work of Fahrraus and Plant respectively, the sedimentation test has come into use as a diagnostic and prognostic means of determining a diseased state. The majority of European authors believe that an abnormal sedimentation rate is most useful as a prognostic lead, to indicate that the patient is not healthy. However, they believe that a normal sedimentation time does not necessarily rule out serious disease.

The American investigators believe that the changes in the rate of sedimentation parallel the severity of the disease, becoming more rapid as the disease becomes worse, and slowing down to normal as the patient improves.

Westergren considered the normal sedimentation for males to be from 1 to 3 mm. at the end of one hour, with normal limits of from 4 to 7 mm., and that for females, from 4 to 7 mm., with normal limits of from 8 to 11 mm. Linzenmieir made his readings every fifteen minutes for one hour. The height of the column of sediment in millimeters was his index of sedimentation. The normal index as determined by this method was 7 mm. for men and 10 mm. for women, in one hour's time. Payne used a micromethod and found that in normal controls the reading in one hour was from 3 to 6 mm. He considered 10 mm. or over to be the index of an abnormal state of health.

Since our interest in the subject is limited to the sedimentation rate in rheumatism, we shall summarize the literature only as it refers to that work that has been done in this disease. Kahlmeter studied a series of about 60 cases of acute rheumatic fever and obtained high values of from 100 to 120 mm. and over in the acute form and from 60 to 80 mm. in the subacute form. He found that these high rates decreased with a retrogression of the clinical symptoms. He believes that the sedimentation reaction is a much more sensitive criterion for the prognosis of the disease than are the clinical symptoms. In his experience, signs and symptoms frequently ceased, except for occasional slight pains in the joints, even though the sedimentation reaction was not normal.

Payne studied the sedimentation index (the extent of sedimentation in a given time as differentiated from the sedimentation rate when the amount of sedimentation is fixed and the time is a variable) in a group of children suffering from an epidemic of tonsillitis while convalescing from rheumatic fever. He found a close relationship between the sedimentation index and the clinical findings. He believes that the test is of use in giving a good numerical index to the progress, which enables the physician to have a more certain idea of the efficiency of his treatment.

Ernstene studied the sedimentation rate in 22 cases of acute rheumatic fever and concluded that it was an accurate index of the severity of the infection. He held that the infection cannot be considered as arrested until the rate has become and remains normal.

Bach examined the sedimentation rate in 75 children suffering from rheumatic fever and found that in the active state the rate was increased, while in the quiescent period unassociated with clinical signs the rate approached normal limits. He thought that the rate was uninfluenced by the degree of cardiac damage. In cases in which definite clinical signs of active infection were noted, the rate varied from 126 to 130 mm. at one hour, and from 136 to 160 mm. at two hours. He used the Westergren technic with a normal limit of 10 mm. or under at the end of one hour and of 20 mm. at two hours. He is of the opinion that in rheumatic children with a sedimentation rate of less than 21 mm. at the end of one hour there is an absence of clinical signs of rheumatic activity. This brief résumé emphasizes the difficulties in determining the validity of this test for the diagnosis and prognosis of rheumatism: first, because of the differences in technic employed by the various investigators, which make the comparison of the statistical data impossible and, second, because of the lack of proof of the reliability of the test itself.

In a study of the sedimentation rate by the Cutler method we found a suggestive difference between the normal controls and the other three rheumatic groups. The average rate of drop at the end of an hour

for the normal subjects was 5.9 mm., whereas that for the patients with inactive rheumatic fever was 10 mm., that for the patients with muscular rheumatism was 8.7 mm. and that for the 6 patients with chorea was 11 mm. If we use 10 mm. as the limit of normal variation we find that only 17 per cent of the normal subjects showed a precipitate below 10 mm. in contrast to 40 per cent of each of the abnormal groups. Moreover, in the normal group there were no instances in which the reading was over 16 mm., whereas from 20 to 25 per cent of cases in the other groups were characterized by a reading over 16 mm. Our study of this phase of the subject is incomplete because of the small number of sedimentations and because we have as yet not determined the reliability of the test itself.

STREPTOCOCCIC AGGLUTINATION

The agglutination test as a means of classifying streptococci has been widely discussed by many authors, and a recent review of this general subject may be found in the annals of the Pickett-Thomson Laboratory. Examination of the literature fails to disclose any investigation of streptococcic agglutination in what we prefer to call muscular rheumatism. In several early papers mention is made of the presence of streptococcic agglutinins in the blood serum of patients with rheumatic fever. Tunnicliff in 1909, Clawson in 1925, Small in 1928, and Cecil, Nicholls and Stainsby in 1929 were all able to demonstrate these immune bodies in varying percentages in the serum of adults suffering from rheumatic fever. In 1917, Kinsella and Swift, in attempting to classify twenty-eight strains of nonhemolytic streptococci isolated chiefly from cases of acute rheumatic fever and bacterial endocarditis, found that the agglutination reaction was unsatisfactory because a strongly positive reaction was not always present between serum and the corresponding streptococcus, and because cross-reactions were comparatively few. More recently additional data on this subject have been presented by: Cecil, Nicholls and Stainsby; Coburn and Pauli; Dawson, Olmstead and Boots; Keefer, Myers and Oppel, and Nicholls and Stainsby. With the exception of the group studied by Clawson et al., the subjects were not confined to children. It is impossible to compare the actual titers obtained in the various laboratories because of the differences of technic used and also because there is a wide variation in the sensitivity to agglutination of different strains of streptococci. It may be said, however, that the range of streptococcic agglutination in each laboratory in rheumatic fever as compared with control groups is of significance. Nicholls and Stainsby and Clawson and his co-workers, as well as Keefer, Myers and Oppel, have demonstrated a definitely higher average titer in serums of rheumatic fever

as compared with the controls, while Dawson, Olmstead and Boots and Coburn and Pauli did not find any significant elevation in cases of rheumatic fever. Clawson used two strains of streptococci, one isolated from the blood of a patient with chronic arthritis and the other from the blood of a patient with acute rheumatic fever. As compared with a control group, he found a marked elevation of the agglutination titer with both strains in the serums from patients with scarlet fever and chronic glomerulonephritis, as well as a less marked, though significant, elevation in the serums from children with rheumatic fever and adults with chronic arthritis. This evidence supports the view that rheumatic fever is a streptococcic infection, and that it is not due to a specific strain of Streptococcus. This idea is substantiated in a very recent paper by Keefer, Myers and Oppel, no evidence of strain specificity having been found in a large series of positive streptococcic agglutination tests. Positive streptococcic agglutination was obtained in 27 per cent of a total of 42 cases of rheumatic fever in contrast to an entire absence of any agglutination in the normal controls.

Fifty-five children in whom chronic muscular pains were predominant but associated in most instances with pains in the joints and occasional slight elevations of temperature were tested for the presence of streptococcic agglutination in the blood serum. The titers were compared with those of two other groups: One group was comprised of 26 children with no clinical evidence of streptococcic infection (called normal children); the other group, of 69 children with rheumatic fever in the convalescent and inactive stages. Each of the patients in the last group had had an acute febrile attack of varying duration with multiple, swollen, painful joints, without subsequent permanent changes in the joint, but with a high incidence of organic heart disease. The tests were carried out in the laboratory of Prof. B. J. Clawson of the Department of Pathology of the University of Minnesota, whose technic may be briefly described as follows: The strain used was one which had been isolated from the blood of a patient who had acute rheumatic fever. It had been kept on artificial mediums for nine years. It produced a slight amount of green discoloration on sheep's blood agar, and it cross-agglutinated in high dilutions (1:50,000) with most other strains of acute rheumatic and chronic arthritic origin. For the agglutination tests, sediments of a twenty-four to forty-eight hour broth culture were suspended in 0.9 per cent salt solution. The suspension was diluted so that when mixed with an equal amount of the respective dilutions of the serum a faint milkiness could be observed.

The samples of blood, which were obtained in most instances from a vein in the arm and in a few from the femoral vein, were stored in the icebox for twenty-four hours, at the end of which time the clear serum was pipetted off. The serums were diluted with salt solutions

as follows: 1:25, 1:50, 1:100, 1:200, 1:400, 1:800, 1:1,600, 1:3,200 and so on. One cubic centimeter of each dilution was placed in respective Wassermann tubes and to each of the tubes was added 1 cc. of the streptococci, giving a total volume of 2 cc. in each tube. The final dilutions were twice those of the serums. The tubes were incubated in a water bath at 40 C. for two hours and then placed in the icebox until the next morning, when the agglutination titers were read.

The average agglutination titer of the 26 normal children was 1:160; that of the 55 patients with muscular rheumatism, 1:1,500, and that of the 69 with rheumatic fever, 1:1,640 (table 6). In terms of frequency, 92 per cent of the titers of normal children were 1:200 or less, with the highest titer 1:800; whereas only 7 per cent of the titers of those with muscular pains and 11.5 per cent of the titers of those with rheumatic fever were 1:200 or less. Their highest titers were 1:6,400

TABLE 6.—*Streptococcic Agglutination Titers*

Group	Subjects	Age	Percentage of Group Showing Agglutination of Streptococci in Given Dilution of Serum									Average Titer
			1:0	1:50	1:100	1:200	1:400	1:800	1:1,600	1:3,200	1:6,400+	
Normal.....	26	1-11	15.4	27	19	30	4	4	0	0	0	1:160
Muscular rheumatism..	55	4-14	5	2	0	0	20	31	27	10	5	1:1,500
Rheumatic fever, convalescent and inactive stages	69	2-14	1.5	1.5	1.5	7	21.7	20.3	27.5	11.6	7.4	1:1,640

and 1:12,800, respectively. It is interesting to note the slight difference between the average titers of both pathologic groups as contrasted with the great difference between them and the average titer of the normal children. We do not include the statistics concerning the relationships between agglutination titer and weight-height index, white blood count, fever and duration of symptoms, because they are of no positive value.

COMMENT

We have presented in this paper the results of a study of 35 children suffering from what are predominately chronic muscular pains. We have found no evidence to substantiate the old idea that normal growth causes chronic muscular pains. We believe, therefore, that the term "growing pains" is a misnomer and should be discarded. We believe that the descriptions of what has been referred to as chronic fibrositis or myofibrositis do not fit the cases which we have studied. We do have to consider as not infrequent causes of muscular pains chronic fatigue and orthopedic disorders, such as flat feet and scoliosis. In chronic fatigue, the lower extremities are most frequently involved, the pains are not migratory, adequate health schedules effect a cure, the

joints are not painful, the pains are not present during sleep, and they are not affected by the seasons of the year. There is a history of inadequate sleep and improper diet. The streptococcic agglutination titer is not higher than the normal. Orthopedic disorders may be ruled out by the presence of anatomic deformities in the parts of the body which are involved, and the complaint of pain is more localized. The chief question to which we directed our efforts was whether children with chronic muscular pains present evidence of chronic infection. The data which we have presented in this paper are strikingly in favor of an infectious etiology. The presence of continuous or intermittent pains, their migratory character, the involvement of any or all the muscles of the body as well as of the contiguous joints, the high incidence of rheumatism in other members of the same family, the relatively high incidence of organic heart disease, the onset of some of the attacks with sore throat, the persistence of symptoms in spite of rest and adequate health schedules, the higher incidence during the winter and spring and the practical absence during the summer months, and finally the strikingly high streptococcic agglutination titer as compared with a much lower titer in the normal group point strongly to an infectious origin. Moreover, in view of the cardiac complications, the high agglutination of the streptococci, which according to some investigators may be the bacteriologic cause of rheumatism, and the high incidence of other forms of rheumatism in the same family, there is good reason to believe that the infection is of a rheumatic nature. On the basis of the data which we have presented, we feel justified in classifying these muscular pains as muscular rheumatism of childhood.

SUMMARY AND CONCLUSIONS

1. The term "growing pains" is a misnomer and should be discarded.

2. Chronic pains in the muscles which can be differentiated from chronic fatigue and definite orthopedic disorders are probably the result of a chronic infection.

3. Twenty-one per cent of 208 children from 8 to 15 years of age gave histories of having muscular pains over a period of three months or more.

4. The age incidence of these muscular pains was practically the same as that for all other forms of rheumatism. It was no higher during puberty than at any other period.

5. There was a significant relation between muscular pains and inadequate sleep according to Pearl's scale (825:1).

6. There was a significant relation between muscular pains and fatigue according to Pearl's scale (400,000:1).

7. Systolic murmurs developed in 30 per cent of the children who had continuous fever and in only 19 per cent of the children who were afebrile. (Of these, 11 per cent acquired chronic mitral endocarditis.)

8. The average sedimentation rate at the end of one hour (Cutler's method) for the normal group was 5.9 mm.; for the convalescent rheumatic persons and those in whom the disease was inactive, 10 mm.; for those with muscular rheumatism, 8.7 mm., and for those with chorea, 11 mm.

9. The average streptococcic agglutination titer for the normal group was 1:160, and for the children with muscular rheumatism, 1:1,500.

10. In the normal group, 92 per cent of the titers were below 1:200, whereas in the abnormal groups only 7 per cent were below 1:200.

Prof. B. F. Clawson of the University of Minnesota supervised the titrations done in his laboratory. Dr. C. E. Remy, superintendent of the Minneapolis General Hospital, Vera J. MacKinnan, cardiac nurse, and M. P. MacIntyre, social worker, gave their cooperation in the clinic. Dr. Macnider Wetherby read and reviewed the paper.

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Pediatric Biographies

RICHARD WARREN
1731-1797

JOHN RUHRÄH, M.D.
BALTIMORE

Readers of Macmichael's "Gold-Headed Cane" will remember Pitcairn's nephew, about whom not a little is said, but apart from these few today have heard of Richard Warren, although he was well known in his day, and left a classic description of a bronchial cast in a child which places him in the pediatric ranks.

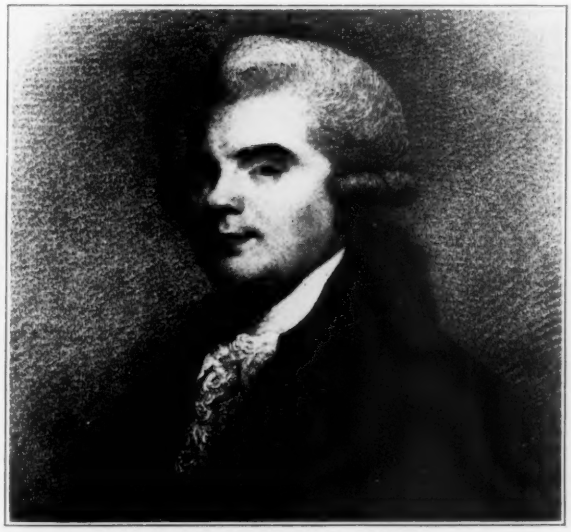
His father was a clergyman of eminence and a scholar of distinction. Young Warren, the third son, was sent to the grammar school at Bury St. Edmund's and in 1748 entered Jesus College, Cambridge, where he was granted his degree in 1752 and was fourth on the list of wranglers. He obtained a fellowship at Jesus College. The church was open to him as a profession, but his preference was for the law. One of his pupils was the son of a physician of prominence, Dr. Peter Shaw, who recommended that the young tutor go into the medical profession. In 1755 he received his degree of Master of Arts and in 1762 his degree in medicine, and was admitted as a Candidate of the College of Physicians the same year. The next year he was made physician in ordinary to the King, and a Fellow of the College of Physicians.

He was Gulstonian lecturer in 1764, gave the Harveian oration in 1768, was Censor in 1764, 1776 and 1782 and was named an Elect in 1784. He served on the staff of the Middlesex Hospital and later on that of St. George's Hospital.

He rapidly obtained a large practice in the highest circles and attended the Princess Amelia, daughter of George the Second. He later succeeded his father-in-law as physician to George the Third. He is said to have realized 9,000 pounds a year from his practice, and left a fortune estimated as above 150,000 pounds. His busy life left him little time for writing, and only two papers appear in the *Medical Transactions of the College of Physicians.* One is on colica pictomum; the other is noted subsequently. He had the personality and charm so essential to great success in practice. He is said to have been able

to accommodate himself to the young, the old, the gay and the sorrowful. He died on June 22, 1797, of erysipelas of the head. His portrait by Gainsborough hangs in the College of Physicians in London.

Bronchial casts had been described before. Comments on them probably go back to Hippocrates. Nicholas Tulp, in his "Observationes Medicae," 1716, gives an account of a case in a sea captain. Warren's description of the condition is clear and thorough. It is recorded in the *Medical Transactions of the College of Physicians, London* (**5**: 407, 1772):



RICHARD WARREN, M.D., F.R.S. AND S.A.
1731–1797

XVI. OF THE BRONCHIAL POLYPUS: BY R. WARREN, M.D., FELLOW OF THE COLLEGE OF PHYSICIANS, AND OF THE ROYAL SOCIETY; AND PHYSICIAN IN ORDINARY TO HIS MAJESTY.

Read at the COLLEGE, August 11, 1767.

POLYPOUS concretions, in different parts of the body, have been described by various anatomical and medical writers; but that species of *polypus* called the bronchial, formed in the ramifications of the *aspera arteria*, has escaped the observation of the greater number of them, and has almost always been mistaken for something else by the few who have seen it.

In the spring of the year 1764, a young lady, eight years old, of a strumous habit, was seized with a difficulty of breathing, attended with a short, dry, and almost incessant cough; but without any pain in her sides or breast. During the course of the day, the difficulty of breathing and cough lessened; she rested tolerably well at night, and was free from complaint the next morning. About six weeks after this, I found her more oppressed than she was described to me to

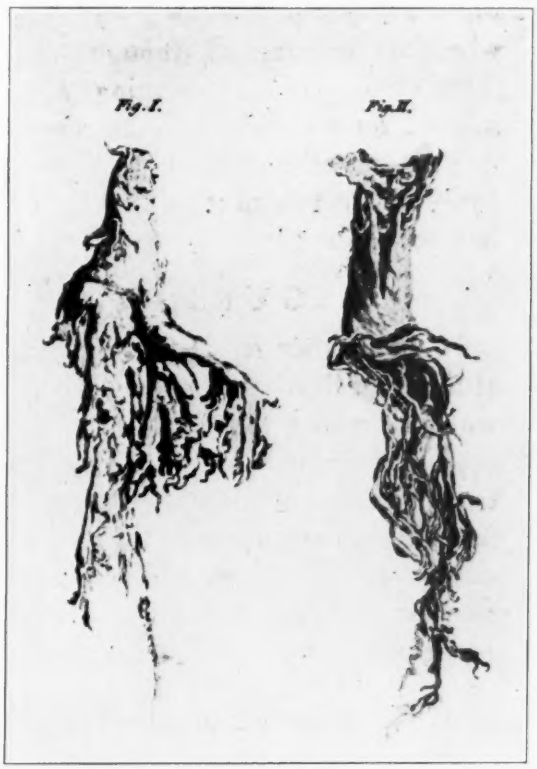
have been before: her pulse was too quick to be counted with accuracy; her tongue was white and moist; her head was clear; her bowels were costive; and she was perfectly free from all painful sensations, except that of weight on the chest. Five ounces of blood were taken away; a blister was applied to her back; and an opening draught was directed. Soon after the bleeding, the difficulty of breathing began to lessen; and after the opening draught had operated, it was still more relieved. The next morning, her breath continuing oppressed, and her pulse beating about an hundred and twenty times in a minute, it was determined to purge her still more, upon a supposition that worms, in so young a subject, might probably be the cause of these complaints: no worms, however, came away; but after two or three copious stools, her breathing was considerably relieved. During the six following days, her pulse beat about an hundred times in a minute; and her breathing, when she was quite still, was tolerably easy; she eat heartily; coughed frequently, but without any expectoration; sweated profusely in the nights; and wasted very much. On the seventh day the extreme difficulty of breathing returned with a pulse as quick as before; but was much relieved by a dose of *oxymel scilliticum* which made her vomit two or three times. During the four following days, she took ten drops of *oxymel scilliticum* in an ounce and half of water every eighth hour. The difficulty of breathing decreased under this course; but the pulse continued to beat more than an hundred and twenty times in a minute. In the night of the twelfth day from the attack she waked suddenly, and was almost choked by bringing up, by coughing, a large polypous concretion. It came up without either blood or *mucus;* and instantly gave her great relief. During the two following months, she seldom passed three days without coughing up some pieces, but none so large as the first. Her breathing continued to be much affected by motion in a room; but was tolerably easy when she was sitting still, or even when she was in motion in the open air. Though her pulse never beat less than an hundred and twenty times in a minute, from the time that she began to cough up the *polypi,* yet she had a good appetite; gained some strength and flesh; and entirely lost her sweats.

THIS is the history of the case from its beginning in February 1764 to the night preceding the 28th of May following; when the quickness of pulse and difficulty of breathing returned with as great violence as ever. In the morning a larger *polypus* was coughed up than at any time before, and, in four days following, as great a quantity as in the six weeks preceding.

FROM this time the oppression on the lungs returned irregularly, after an interval of five, eight, ten, or even twenty days; but was sure to be followed by a discharge of the *polypi.* During the intervals, she seemed to make a rapid progress towards health; but when the oppression returned, she was soon reduced again. The disorder went on in this manner till more than a year after the first attack; when she began to complain of a pain in her right heel. As the pain increased, the returns of the oppression became less frequent, and fewer *polypi* were thrown up. Some weeks after she had complained of the pain in her heel, it was discovered that matter was formed there; and, upon letting it out, the *os calcis* was found carious. From the time that this matter was discharged (now more than two years since) she has had no return of the difficulty of breathing; has brought up no more polypous concretions; and has been perfectly free from every pulmonic complaint. The sore in the heel has remained

ever since; and a glandular swelling in the neck, which was in a state of suppuration before, and at the time that the *polypi* were thrown up, continues still to discharge.

BEFORE we describe these *polypi* it may be worth while to observe that though the cause of the oppression, and difficulty of breathing was permanent, the effect was by no means so, especially at the beginning of the complaint. For it is highly probable, that the *bronchia* were in some degree plugged up with these concretions at the time when the difficulty of breathing first attacked her; though



Warren's illustration of bronchial casts.

the oppression ceased without anything being spit up, and left her well for near a month. On the second attack, in April, the vessels were more stuffed than before; yet the difficulty of breathing mended for several days before the first *polypus* was coughed up. The bleeding and evacuation by stool might probably give some little relief the second time; but, the first time, as I was informed, no attempt was made to relieve her. Did not the efforts of the lungs to throw up these concretions change the situation of them in such a manner as to lessen the oppression? I suppose this to be the case; because whenever she coughed, though nothing came up, her breathing was relieved for a time.

THE greatest number of these *polypi* are from two to three, and some four inches long.

IN figure they represent very exactly a branch of the *aspera arteria* with its smaller ramifications. At one end they are formed into a thick trunk, the extremity of which is broken and ragged; and towards the other end there is a regular ramification into smaller, and at last almost evanescent twigs. Fig. 1. 2.

COLOUR

THEIR colour immediately, and for some days after they came up, was neither of the yellowish nor bluish cast, which is commonly observed in the *mucus* that is brought up by coughing; but of as bright a white, and as opake too, as a curd of milk.

Pediatrics in Art

A LAPLAND INTERIOR

JOHN RUHRÄH, M.D.
BALTIMORE

Johan F. Höckert (1826-1866), the Swedish artist, painted a Lapland interior which is of great interest from a pediatric standpoint. The suspended cradle with its covered hood and rope binder is of a somewhat different model from those usually seen. The hands are left free, but the child cannot turn and must stay on its back. Felix Würtz

A Lapland interior showing a swinging cradle and retaining binder.

describes such binding, "whereby the inlaid Child is packed up like a pack of wares."

The picture is in Stockholm, and the photograph is by the National-musei Fotografiförsäljning.

Abstracts from Current Literature

Anatomy and Physiology

THE INFANT LARYNX. GABRIEL TUCKER, J. A. M. A. **99**:1899 (Dec. 3) 1932.

The peculiarities of the structure of the infant larynx makes it a more important etiologic factor in respiratory and throat diseases than the larynx of the adult. Complete examination is possible by the direct method. It increases the dyspnea, but with proper assistants and equipment emergencies can be met successfully. A method of taking the measurements of the larynx is given, the most important of which is the subglottic diameter, averaging 6 mm. in a well developed infant. Tracheotomy preserves the structure of the larynx better than intubation. Often symptoms of laryngeal disease in infants are ignored until serious complications supervene. Laryngoscopic examination will save many lives by permitting early and correct diagnosis.

BONAR, Salt Lake City.

COMPARATIVE MEASUREMENTS OF THE SELLA TURCICA IN CHILDREN. LOTTE BRILL, Monatschr. f. Kinderh. **57**:1 (Feb.) 1933.

Brill measured the area of the sella turcica from birth to 10 years of age. She accumulated statistics for every month during the first year of life and, later, for every year of the first ten. From birth to 6 months of age there is a rapid increase of the area, from 15 to 22 sq. mm. The curve of increase then becomes less steep; it reaches 25 sq. mm. by the end of the first year. At 10 years of age the area is 70 sq. mm. In children under 6 years of age the measurements for boys are slightly less than those for girls. No relationship could be established between the size of the sella and clinical entities, with the exception of hypdrocephalus. In this condition enlargement of the sella is frequently found.

GERSTLEY, Chicago.

STRUCTURE OF ARTERIES AND VEINS IN THE TONSILLAR CAPSULE. H. BRUNNER, Monatschr. f. Ohrenh. **66**:1335 (Nov.) 1932.

Brunner discusses the structure of the blood vessels of the tonsillar capsule on the basis of a personal examination of many specimens. The arterial vessels of the tonsil are characterized by an unusually thick tunica elastica interna which can be demonstrated in the walls of their finest ramifications. In the larger capsular arteries, intima cushions which do not show a uniform structure are found, frequently in adults and rarely in children. In surgically obtained tonsils one frequently finds artefacts in the larger capsular arteries caused by rupture of the intima and media. The larger capsular veins may be divided into those rich in muscles and those poor in muscles. All these peculiarities in the structure of the capsular vessels are functionally related to the large variations of the blood supply and circulation within the tonsil. The variations in the blood supply of the tonsil are in turn related to the fluctuating occurrence of the secondary nodules and to the growth and involution of the tonsils. Occasionally in the capsule completely thrombosed veins are seen, in the vicinity of which are signs of tissue irritation; in the author's opinion it is doubtful whether or not septic processes originate from these thrombi. Remnants of obturating thrombi are frequently found in large veins in the form of bands of connective tissue traversing the lumen.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

Pathology, Bacteriology and Biochemistry

THE SIMILARITY OF VIRUS PNEUMONIA IN ANIMALS TO EPIDEMIC INFLUENZA AND INTERSTITIAL BRONCHOPNEUMONIA IN MAN. HOWARD ANDERSON MCCORDOCK and RALPH S. MUCKENFUSS, Am. J. Path. **9**:221 (March) 1933.

The intratracheal injection of concentrated vaccine virus into animals results in a hemorrhagic, edematous consolidation and irregular areas of necrosis and hemorrhage that resemble infarcts, while a dilute virus causes a proliferative cellular lesion which is termed interstitial virus pneumonia. The former is comparable to the pulmonary lesion in rapidly fatal influenza in man, while the latter resembles the interstitial bronchopneumonia which frequently accompanies influenza, measles and whooping cough. A combination of dilute virus and bacterial infection results in the complete picture as seen in man. This experimental result, plus the known occurrence of interstitial bronchopneumonia in measles, vaccinia, psittacosis and some cases of canine distemper, designates the condition as the type reaction for the combination of a virus and bacteria, but it is not specific for a particular virus or bacterium. Its occurrence in influenza and pertussis suggests that a virus plays a rôle in these diseases. A brief review of the anatomic lesions in influenza, measles and whooping cough is given.

MOORE, Cleveland.

PURIFICATION OF POLIOMYELITIC VIRUS. M. SCHAEFFER and W. B. BREBNER, Arch. Path. **15**:221 (Feb.) 1933.

Poliomyelitis virus can be adsorbed and eluted on aluminum hydroxide, yielding a potent virus solution which gives no reactions for protein unless the solution is concentrated. The optimum p_H for adsorption is between 5.8 and 6.4, and for elution, between 8 and 9. Lipids can be extracted with ether from cord emulsions without injury to the virus. The virus is definitely attenuated with safranin.

LEMASTER, Evanston, Ill.

CHRONIC NICOTINISM IN YOUNG RATS AND RABBITS: EFFECT ON GROWTH AND ESTRUS. ALLEN BEHREND and C. H. THIENES, J. Pharmacol. & Exper. Therap. **46**:113 (Sept.) 1932.

Rats were given nicotine subcutaneously in the morning and in the evening. The dose given in the morning usually caused convulsions, but that given in the evening caused less severe symptoms. The rabbits also had tremors or convulsions. This dosage caused an immaterial delay in the curve for the weight of rats, but did not alter the skeletal growth or lessen the intake of food. No change in the estrus cycle of the rat was seen. The curve for the growth of rabbits was not altered.

It would seem that no comparison can safely be made between these results and the results that might follow the use of nicotine in growing human beings.

PILCHER, Cleveland.

A GROUP OF NEW NONLACTOSE FERMENTING PATHOGENIC INTESTINAL MICRO-ORGANISMS. H. GHOSH and A. K. HAZRA, J. Indian M. A. **1**:483 (July) 1932.

The authors report a new group of bacilli which are frequently found in the stools of persons suffering from chronic and acute intestinal catarrh. These organisms resemble the typhoid, paratyphoid and salmonella group and biochemically fall under two types: saccharose fermenters and nonsaccharose fermenters. Protocols of their fermentative, agglutinative and other biochemical characteristics are given.

GONCE, Madison, Wis.

HORMONIC ACTION OF GUANIDINE. A. CABITTO and C. ROSSO, Arch. ital. di pediat. **1**:92 (Sept.) 1932.

After a rather theoretical considération of the literature and their own unpublished works, the authors conclude that there is a consequential relationship between dysfunction of the endocrine glands of branchial origin, modified protein metabolism, hyperguanidinemia, the ionic concentration of the blood and idiopathic infantile spasmophilia.

DOOLEY, Kent, Conn.

THE EFFECT OF ACID AND ALKALINE DIETS ON THE BLOOD PRESSURE CURVE IN CHILDREN FOLLOWING THE INJECTION OF EPINEPHRINE. O. GOEBELL, Arch. f. Kinderh. **99**:36 (March 21) 1933.

In vagotonic children the injection of epinephrine caused only a slight rise in blood pressure of short duration. However, after the patients had been given an acid-producing diet for several days, an injection of epinephrine caused a marked rise of blood pressure of much longer duration. In sympathicotonic children epinephrine caused considerable elevation of blood pressure for a long period, but after the administration of an alkaline diet, the effect of epinephrine on the blood pressure was very mild and transitory. It is suggested that variations in the acid-base balance of the body affect the irritability of the sympathetic and parasympathetic nerves, and hence alkaline or acid diets should prove of value in conditions in which there is a dysharmony between these two nervous systems.

LEMASTER, Evanston, Ill.

AN INVESTIGATION INTO THE STRENGTH OF THE SKIN CAPILLARIES AND INDIRECTLY INTO THE VITAMIN C STANDARD OF SCHOOL CHILDREN IN THE DISTRICT OF NORRBOTTEN, NORTH OF THE ARCTIC CIRCLE. GUNNAR FALK, KARL OVE GEDDA and GUSTAF F. GOTHLIN, Skandinav. Arch. f. Physiol. **65**:24, 1932.

In some parts of Norrbotten at the end of the winter 21.5 per cent of the school children suffered from a deficiency of vitamin C. In regions where the intake of vitamin C with the food (milk and potatoes) is high, the capillary strength is high, and where it is low, the capillary strength is low. In order to attain a normal capillary strength, children of school age require a larger intake of vitamin C per kilogram of body weight than do adults.

KUGELMASS, New York.

Nutrition

VITAMIN D CERTIFIED MILK: ITS ANTI-RACHITIC VALUE AS SHOWN BY RAT EXPERIMENT. W. E. BROWN and J. F. KOWALEWSKI, J. Med. **13**:646 (Feb.) 1933.

Healing was instituted in rachitic rats (fed twenty-one days on Steenbock diet 2965, the presence of rickets being established by roentgenograms and by the line test) by the daily addition for ten days of 6 cc. of whole milk from cows fed on irradiated yeast.

NELSON, Cincinnati.

EFFECT OF EVAPORATED MILK ON THE INCIDENCE OF RICKETS IN INFANTS. D. J. BARNES, J. Michigan M. Soc. **31**:397 (June) 1932.

There is some evidence, possibly on the basis of increased calcium and phosphorus absorption, that evaporated milk as a food may be productive of less rickets than whole milk. In Barnes' study evaporated milk did not protect adequately against the development of rickets.

SMITH, Ann Arbor, Mich.

GROWTH AND DEVELOPMENT. C. ANDERSON ALDRICH, J. Pediat. **2**:80 (Jan.) 1933.

In this critical review, Aldrich discusses present theories concerning the nature of growth. The process of growth is complicated by numerous factors such as individual variation; different growth rates in various organs of the body; nutritional factors, such as food, vitamins, amino-acids and minerals; endocrine glands; heredity; disease processes, and environmental influences, such as temperature, sunshine and season. The author has condensed and correlated the most widely accepted ideas on such subjects as the autocatalytic theory, the laws of growth, causes of cell division and growth formulas. The more modern theories of growth and development seem to indicate that, owing to the process of mitosis and nuclear division, each cell of the early embryo inherits all of the original germ plasm, that differentiation comes about through the interplay of organismic pattern, external environment and polarity, and that gradients are important factors in this differentiation. The reason for cessation of growth and its coincident senescence may lie in the production of growth—inhibiting substances in connection with the advanced differentiation of the cells.

LEMASTER, Evanston, Ill.

A STUDY OF SOME VITAMIN B ADSORBATES. VICTOR BIRCKNER, Pub. Health Rep. **48**:7 (Jan. 6) 1933.

Fuller's earth has been used as an adsorbent for removing vitamin B from yeast extracts as a means of concentrating the vitamin. Although Fuller's earth is a good adsorbent for vitamin B, it also adsorbs and carries down with it other substances besides the vitamin. To find a method for removing these impurities was the purpose of the author's investigations. Acetone was found to remove impurities of a fatty nature without decreasing the vitamin B activity of the insoluble residue. Subsequent use of acetic acid removed further impurities. A mixture of 1 per cent hydrochloric and 1 per cent hydrofluoric acid removed a large part of the co-adsorbed impurities from the defatted adsorbates, but a decrease of 10 per cent in the vitamin potency of the residue resulted.

LEMASTER, Evanston, Ill.

FOETAL RICKETS. J. P. MAXWELL, C. H. HU and H. M. TURNBULL, J. Path. & Bact. **35**:419, 1932.

The present case establishes beyond doubt the occurrence of rickets or of osteomalacia in the fetus. The relation of the two diseases is discussed in the light of recent investigations. It is concluded that both are metabolic, are doubtless due usually to food deficiencies and are probably both due to a deficiency of vitamin D. Their causal identity is not, however, proved. Although, therefore, the two cases bring additional evidence of the histologic identity of osteomalacia and rickets, they do not prove the identity of the two diseases.

AUTHORS' SUMMARY. [ARCH. PATH.]

THE MODE OF ACTION OF VITAMIN D: THE "PARATHYROID" THEORY; CLINICAL HYPERVITAMINOSIS. LESLIE J. HARRIS, Lancet **1**:1031 (May 14) 1932.

In part the author's conclusions are as follows: Investigations on hypervitaminosis have substantiated the theory that the characteristic mode of action of vitamin D is to permit an increased "net absorption" of calcium and phosphate from the intestine, which tends to raise the level of the calcium and phosphate of the blood. The latter rise automatically brings about increased calcification in sites provided with the "bone" or "calcifying" enzyme, phosphatase. This action is apparent, whether the vitamin is fed in suboptimal amounts, in doses approaching the optimum or in moderate excess. Hypervitaminosis thus stands in logical contrast with rickets (hypovitaminosis or avitaminosis).

Like vitamin D, the parathyroid hormone can also raise the level of the blood calcium but the available evidence suggests that it does so by draining the mineral matter from the bone, and there are no records of increased net absorption from the intestines. Until evidence of the latter characteristic action is offered, the theory that vitamin D acts normally by simple stimulation of the parathyroid cannot be accepted.

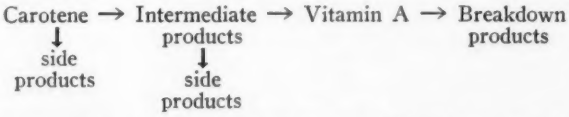
The indiscriminate use of parathormone clinically by patients with suspected deficiency of calcium is to be deprecated, most definitely in such conditions as infantile tetany, osteomalacia and late rickets, for although the administration of this product will succeed in raising a low value for calcium in the blood, it merely aggravates the underlying metabolic error (inadequate retention of calcium and phosphorus), causing a loss of minerals to the body and still further depleting the already impoverished bones.

The ill effects of hypervitaminosis are the same in man as in experimental animals. Clinical experience shows that for the human being the toxic overdose of viosterol is not far removed from the optimal (not minimal) curative dose.

LANGMANN, New York.

CAROTENE AND VITAMIN A. B. WOOLF and T. MOORE, Lancet **2**:13 (July 2) 1932.

The possible types of change undergone by carotene may be summarized thus:



The authors consider it unfortunate that the claim of Olcott and McCann to have produced vitamin A should be based on inadequate evidence. They mention some preliminary experiments of their own on the changes undergone by carotene.

LANGMANN, New York.

THE TREATMENT OF OSTEOMALACIA BY IRRADIATED ERGOSTEROL. J. DECOURT and S. KAPLAN, Paris méd. **2**:485 (Dec. 3) 1932.

The authors obtained excellent results with irradiated ergosterol in the treatment of osteomalacia. They do not believe, however, that this indicated that the condition is due to avitaminoses alone, but more probably to a lack of vitamin D in combination with an endocrine disturbance or some imbalance in the physicochemical equilibrium of the blood.

SANFORD, Chicago.

THE USE OF SOY BEAN FLOUR IN PEDIATRICS. HERMANN BRÜNING, Arch. f. Kinderh. **93**:81 (April 10) 1931.

The reports on experimental and clinical results with soy bean flour are briefly reviewed. Soy bean differs from the other legumes by being much higher in protein and fat content while lower in carbohydrates. Vitamins A and B are present in appreciable amounts. The low cost combined with the excellency of the protein of soy bean recommends its wider use in the diet. All clinical studies indicate that soy bean flour is easily digested and well tolerated.

LEMASTER, Evanston, Ill.

COMPARATIVE STUDIES ON DIFFERENT MILK-COFFEE MIXTURES WITH SPECIAL CONSIDERATION OF RYE COFFEE. SCHOOF, Arch. f. Kinderh. **93**:92 (April 10) 1931.

Previous investigations by Heide and Schilf, Lüers and Böttcher showed that malt coffee infusion and bean coffee infusion caused smaller curds and better

digestibility of cow's milk. Schoof repeated these experiments, also using rye coffee added to milk. The studies were done by adding hydrochloric acid to the mixtures and observing the size of the curds, as well as by numerous tests on animals and human beings to show the size of the curds after a period of digestion. Rye coffee infusion was found to be as effective as the other mixtures in producing small, easily digested milk curds.

LEMASTER, Evanston, Ill.

THE TOXICITY OF ERGOSTEROL PREPARATIONS. O. GÖTTCHE and B. KELLNER, Arch. f. Kinderh. **94**:129 (Sept. 11) 1931.

Four different brands of activated ergosterol were fed to white rats to find the minimum amount of each which would cause toxicity as evidenced by calcification of internal organs when fed daily over a period of two months. While the therapeutic dose of each of the four preparations was about 1 unit, the toxic dose as found in these experiments was as follows: vigantol, 2,500 units; devitol, 2,500 units; ergosterin, 10,000 units, and viosterin, 50,000 units.

LEMASTER, Evanston, Ill.

METABOLISM EXPERIMENTS ON WELL INFANTS DURING THE FEEDING OF VEGETABLE MILK. MARIA NIERMANN and MARGOT WINTER, Arch. f. Kinderh. **94**:146 (Sept. 11) 1931.

Clinical observation and metabolic experiments conclusively demonstrate in this study that vegetable milk is not adequate for the nutrition of infants. The inferior quality of the vegetable protein is considered to be the chief factor which limited the gain in body weight and caused the poor results shown by the metabolic studies in the five infants of this series.

LEMASTER, Evanston, Ill.

EFFECT OF HYPERTONIC DEXTROSE SOLUTION GIVEN INTRAVENOUSLY: PART I. E. V. GYÖRGY and L. VESZELSZKY, Arch. f. Kinderh. **98**:70 (Dec. 13) 1932.

A 40 per cent solution of dextrose was administered intravenously to children in varying amounts and the effect observed. From 0.3 to 0.4 Gm. per kilogram of body weight produced no sugar in the urine, no fever and no chill. When from 0.5 to 2.0 Gm. of dextrose per kilogram of body weight was injected, sugar was excreted in the urine; fever appeared about two hours after the venoclysis, and a chill occurred. When 20 units of insulin was introduced with the dextrose solution the body temperature did not rise but glycosuria occurred as with the administration of dextrose alone. Infants apparently tolerated the dextrose solution better than children, since from 2.0 to 2.5 Gm. per kilogram of body weight caused no fever, even though sugar could be detected in the urine. The authors believe that the fever is due to osmotic changes in the tissue cells and fluids occurring when the dextrose is present in greatest concentration in the tissues about two hours after intravenous injection.

LEMASTER, Evanston, Ill.

THE PASSAGE OF THYROID HORMONE IN THE MILK. SAINT KONSULOFF, Arch. f. Kinderh. **98**:86 (Dec. 13) 1932.

In a previous publication, Dr. J. Lukács reported that when mother rats were fed thyroid substance, their nursing litters grew only from 58 to 65 per cent as much as the litters of control animals. Konsuloff points out that large doses of thyroid decrease the amount of milk produced by the lactating rats so that their litters receive less milk than the control animals. Moreover, among the treated animals, those from large litters grew less rapidly than those from small litters, whereas the opposite would be true if the thyroid content of the milk effected the delayed growth, because each nursing young of the smaller litters, receiving more milk, would also receive more thyroid. Hence this method is unsuitable for the experimental demonstration of the passage of thyroid hormone in the milk.

LEMASTER, Evanston, Ill.

THE PHYSICAL DEVELOPMENT OF CHILDREN WITH NEGATIVE TUBERCULIN REACTIONS. J. PEISER, Gesundhfürs. f. d. Kindesalt. **7**:103 (June) 1932.

Nineteen hundred siblings, some of whom reacted positively to the Pirquet test and some of whom reacted negatively to this test, were examined anthropometrically. No difference was observed between the two groups. Therefore, there is no evidence that children with a negative Pirquet reaction have a better physical development than those with a positive Pirquet reaction.

ABSTRACTOR'S NOTE.—It is to be observed that the author makes the common error of regarding a negative Pirquet test as equivalent to a negative tuberculin test.

REICHLE, Cleveland.

CHLORIDE RETENTION IN INFANCY. G. TOROK, Monatschr. f. Kinderh. **55**:312 (Jan.) 1933.

The technic used in these studies was that of Romminger, which consisted of blood chloride determinations on the venous and the capillary blood. The difference between the analyses of the capillary and the venous blood represents the amount of chloride retained in the tissues. If an adult is given approximately 10 Gm. of sodium chloride, there is an increased chloride content in both types of blood lasting about two hours. There may be considerable difference between the content of the capillary and that of the venous blood, depending on the state of the tissues.

When these experiments were conducted on normal new-born infants and sodium chloride was given in relatively large doses (35 to 40 cg. per kilogram), the author was astonished that no increase in sodium chloride could be found either in capillary or in venous blood in the two hours following administration. Indeed, in some cases the content was diminished.

The author concludes from these experiments that the liver of the nursling is more active in its chloride retention capacity than the liver of the adult and that the stored up sodium chloride is gradually released to the tissues when desired. Under these circumstances diarrhea is not caused by direct action of the salt, but results when the liver is oversaturated and is forced to dispose of the excess.

These experiments, furthermore, show no parallelism in the nursling between the retention of sodium chloride and the retention of water. Likewise, in decomposition, no changes could be demonstrated in the salt-binding properties of the tissues.

GERSTLEY, Chicago.

BLOOD PROTEIN DETERMINATIONS IN INFANCY. F. VON TORDAY and E. VON FROLICH, Monatschr. f. Kinderh. **55**:425 (Jan.) 1933.

In determining total blood protein as well as albumin-globulin ratios, the authors found that there was no difference in the blood of nurslings, whether they were normal or debilitated. On the other hand, infants malnourished by reason of tuberculosis, pneumonia and purulent processes showed a diminution of the albumin-globulin quotient in that albumin remained unchanged while globulin increased.

GERSTLEY, Chicago.

CLASSIFICATION OF INFANTILE NUTRITIONAL DISTURBANCES ACCOMPANIED BY DIARRHEA AND PRINCIPLES OF TREATMENT. A. BRATUSCH-MARRAIN, Wien. klin. Wchnschr. **44**:1286 (Oct. 9) 1931.

The author prefers a classification according to clinical symptoms. The various types differ mainly in the degree of severity. The treatment consists mainly of dietetic measures—depriving the bacteria, which are the cause of the disease, of a nutritive medium, and healing the inflammatory processes of diseased organs. Astringents may also be employed.

In dyspepsia, which is the mildest form of nutritional disturbance, the tolerance is not lowered as is shown by the good appetite. It is sufficient to modify the diet by a decrease of carbohydrates, an increase in flour and the addition of rice

water. Albumin milk, tannic acid and bismuth preparations may be used. In enterocatarrh and gastro-enteritis fasting is instituted before the dietetic treatment is begun for from eight to twelve hours, in the former condition and for as long as twenty-four hours in the latter. Here the decreased appetite shows decreased tolerance. In intoxication or cholera infantum, which is the gravest form, the fasting should be continued till all pathologic processes in the intestines are healed. After this a normal diet is gradually introduced, beginning with very small amounts (5 cc.) of cow's milk.

ABT, Chicago.

DIETARY DEFICIENCY OF FAT-FREE DIET FOR RATS. UME TANGE, Proc. Imp. Acad. Tokyo **8**:190, 1932.

Rats were fed a basal diet containing 21 per cent purified casein, 75 per cent purified starch and 4 per cent McCollum's salt mixture supplemented with 5 cc. of yeast extract (equivalent to 5 Gm. of yeast) per hundred grams of basal diet. Vitamins A and D were supplied by the administration of a drop of a 1 per cent solution of viosterol free from fat and 0.001 per cent solution of irradiated ergosterol a day. The group of animals receiving the basal diet plus 0.078 Gm. of linoleic acid per day was healthy; the hair was fine and lustrous, and the eyes were clear and bright. The group receiving oleic acid instead of linoleic acid grew at the normal rate, but lost hair around the nose and mouth; swelling of the front paws followed by slight scaling of the hindlegs was also observed. In rats receiving the basal diet alone a disease resembling pellagra developed; it was characterized by loss of weight, loss of hair, swelling of the front paws and scaling of the back legs. These animals soon died, unless linoleic acid was administered. Linolenic acid has the same effect as linoleic acid.

KUGELMASS, New York.

Prenatal Conditions

CONGENITAL HEART DISEASE: COR BILOCULARE. M. A. KUGEL, Am. Heart J. **8**:280 (Dec.) 1932.

This extremely rare case of a pure biloculate heart is reported with all the accompanying details, both clinical and pathologic. The patient was an infant of 4 months, markedly cyanosed since birth, but presenting no murmurs. The roentgenogram showed a globular heart, almost entirely on the right side and with only one large vessel arising from the base of the heart.

BACHMANN, Chicago.

INTRACRANIAL INJURIES OF THE FETUS. F. L. ADAIR, J. Michigan M. Soc. **31**:363 (June) 1932.

In a series of 961 autopsies on new-born infants, the largest single cause of death (31.2 per cent) was trauma at birth. Of the 300 cases which made up this percentage, a clinical diagnosis of trauma at birth appeared in only 4, and this cause was given in about 7.5 per cent of the death certificates. The autopsy showed birth trauma in 22 of 39 cases in which a clinical diagnosis of asphyxia was made. As factors in the production of these injuries, Adair found early rupture of the membranes, prolonged labor, placenta praevia, abruptio placentae, breech and cross positions of the fetus and instrumental and breech extractions.

The author discusses many mechanical factors etiologic in the production of injuries at birth. Among them are the variations of pressure as applied to the fetal parts in utero compared to the presenting part, the violence of some short, precipitate labors, the stresses on falx and tentorium in molding of the head and the depression of the occipital bone as it emerges under the pubic symphysis. In treatment, the author stresses recognition of the condition and gentle handling of the infant, as well as maintenance of fluids and temperature, the administration of sedatives when needed, injection of whole citrated blood and the judicious use of spinal puncture.

SMITH, Ann Arbor, Mich.

OMPHALOCELE CONGENITALIS. J. W. GORDON, J. Michigan M. Soc. **31**:533 (Aug.) 1932.

Gordon gives a description of the condition, with theories as to its origin. He reports a fetal type of omphalocele, with all of the small intestine, cecum, appendix and the ascending, transverse and descending colon in the sac, in a male infant. The child was born eighteen days before labor was expected. The viscera were replaced by surgical operation at 1½ hours of age, and the infant recovered after a stormy postoperative period. SMITH, Ann Arbor, Mich.

CONGENITAL OCCLUSION OF THE DUODENUM AND SMALL INTESTINE: A CLINICAL CONSIDERATION WITH REPORT OF TWO SUCCESSFUL CASES. R. FRANKLIN CARTER, J. Pediat. **2**:27 (Jan.) 1933.

Congenital obstruction of the duodenum is discussed from the point of view of frequency, etiology, pathology, diagnosis and therapy. Early diagnosis and adequate preoperative administration of dextrose and salt solution are stressed. The operative procedure depends on the site of the occlusion. The clinical course and findings in two cases in which operation was performed successfully are described, and numerous references to other reported cases are cited.

LEMASTER, Evanston, Ill.

CONGENITAL MORBUS CORDIS: TRANSPOSITION OF THE AORTA AND PATENT INTERVENTRICULAR SEPTUM. K. A. TALLERMAN, Proc. Roy. Soc. Med. **25**:1731 (Oct.) 1932.

The author reports a case in a girl of 7 years who had suffered from cyanosis ever since she was a few months old.

The description is accompanied by a photograph showing clubbing of the fingers and by examination of the reports on the cardiovascular system, blood count, electrocardiogram, orthodiagram and teleoroentgenogram.

WILLIAMSON, New Orleans.

CONGENITAL INTESTINAL OCCLUSION, WITH A REPORT OF FIVE CASES. G. KEITH SMITH, M. J. Australia **2**:685 (Dec. 3) 1932.

The author reports five cases of congenital intestinal malformation, of which three were stenoses and two complete atresia. In the cases reported as stenosis there was no manifest stricture in the sense of a fibrous band, or any kind of band or abnormal structure. Instead, there was found somewhere in the lower part of the ileum a point beyond which the contents had not passed. Above this point the bowel was usually distended, congested and inflamed. Below this point it was contracted and devoid of contents. Histologic examination of the bowel wall above, below and at the site of the obstruction revealed no departure from the normal. These cases of stenosis are attributed to a neuromuscular defect. In all three cases the patients died following enterostomy. The author feels that such an operation insures a fatal outcome, and he suggests treatment in the form of systematic dilatation by means of air or water. The only remedy offering any hope of recovery in intestinal atresia is immediate anastomosis.

GONCE, Madison, Wis.

CONGENITAL MEGACOLON. LEWIS THATCHER, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 171, in Edinburgh M. J., October, 1932.

The speaker showed an infant weighing 6 pounds (2,700 Gm.) at the age of 4 months, with evidences of Hirschsprung's disease, especially emaciation, toxic appearance and intense peristalsis of a dilated and hypertrophied colon which could be seen and felt as if it were a hose-pipe. A preliminary cecostomy to permit keeping the bowel washed out is to be followed by a division of the sympathetic fibers supplying the region.

NEFF, Kansas City, Mo.

RARE CASE OF CONGENITAL MALFORMATION OF THE HAND. TARIK TEMEL, Bull. et mém. Soc. de radiol. méd. de France **18**:109 (March) 1930.

The author describes a case of congenital macrodactylia of the thumb, index finger and the third finger of the right hand. The measurements of the fingers were as follows: thumb, 18 cm. in length and 16 cm. in circumference; index finger, 35 cm. in length and 35 cm. in circumference, and third finger, 28 cm. in length and 21 cm. in circumference. All the bones of the affected fingers were enlarged, the second metacarpals being especially involved.

LEUCUTIA. [AM. J. ROENTGENOL.]

TWO CASES OF FAMILIAL AND HEREDITARY ACHONDROPLASIA. FAVREAU and SENELLART, Bull. Soc. d'obst. et de gynéc. **21**:452 (July) 1932.

Two pregnant achondroplastic sisters were admitted to the hospital six weeks apart. The father was the first known achondroplastic person in the family. He was one of nine children, and the only one to suffer from this disease. He married a normal woman who gave birth to eleven children; seven of these had achondroplasia. There was no achondroplasia among the cousins. The achondroplastic children were otherwise healthy and worked for a living. The husbands of the achondroplastic sisters were normal. The past history and physical and obstetric examination of the sisters were described in detail. Both were delivered by cesarean section because of contracted pelves. Normal infants were obtained in both cases, one weighing 4,050 Gm. and the other, 3,700 Gm.

GLASER, Rochester, N. Y.

TWO CASES OF CONGENITAL CYANOSIS WITH SERIOUS MALFORMATION OF THE HEART. B. WEILL-HALLÉ, KOANG and AUBERT, Bull. Soc de pédiat. de Paris **30**:403 (June 21) 1932.

Two cases of congenital disease of the heart with cyanosis are reported. In one case autopsy revealed a large interventricular septal defect and a large vascular trunk riding over both ventricles and prolonged toward the aorta, which thus received a large proportion of venous blood; to the left posteriorly there was a small pulmonary artery. There was a persistent foramen of Panizza. The infant died after a number of convulsions at the age of 3½ months.

The second infant died when it was 4 months old. Necropsy revealed marked abnormalities of the heart. The right ventricle consisted of a tiny chamber practically without valves and not communicating with the right auricle; the pulmonary artery opened into this atrophic right ventricle, but there was a communication between it and the right auricle; there was a large opening between the two auricles, and the right auricle was enormously dilated. Syphilis as well as vigorous prenatal antisyphilitic treatment, especially in the early months of gestation, are considered to be causal factors in congenital disease of the heart.

BENJAMIN, Montreal, Canada.

ANEMIA PROPHYLAXIS IN PREMATURE INFANTS. S. VAN CREVELD and N. J. HEYBROCK, Rev. franç. de pédiat. **8**:158, 1932.

After following the number of red cells and amount of hemoglobin in one hundred and ten premature infants, the authors have come to the belief that the characteristic anemia of premature infants is caused by a more active hemolysis than in the full-term infant. They were able to prevent this condition by the administration of liver preparations or reduced iron with traces of copper and manganese. It seemed to them that their best results were obtained by a combination of liver extract and a preparation of vitamin D or a combination of reduced iron and vitamin D.

SANFORD, Chicago.

A Case of Maldevelopment of the First Rib. Savès and Barge, Rev. d'orthop. **19**:329 (July) 1932.

The authors report a case of maldevelopment of the first rib on the left side associated with a slight degree of dorsal scoliosis and elevation of the left scapula.

Ryan, Vancouver, B. C.

Congenital Esophageal Stenosis. G. Avella, Prat. pediat. **10**:299 (July) 1932.

The author reports a case of supposedly congenital stenosis of the esophagus in an 8 year old child, and reviews the literature without presenting any new views.

Dooley, Kent, Conn.

Clinical and Histopathologic Study of Two Cases of Congenital Polycystic Kidney. B. Trambusti, Scritti med. dedicati a Carlo Comba, ediz. Riv. di clin. pediat., 1929, p. 861.

In a ninety page article the author reviews especially the pathogenesis of congenital polycystic kidney. Two cases are reported; one patient died at 12 days of age, and the other when only 4 hours old. Twenty-six gross and microscopic photographs of these patients are shown.

The three theories which have been advanced as to the cause of polycystic kidney are based on (1) inflammation, (2) neoplasm and (3) altered development. The author's studies make him incline to accept the third of these theories.

Higgins, Boston.

Congenital Familial Bilateral Ankylosis of the Elbow. M. Acuña and A. Puglisi, Arch. argent. de pediat. **3**:333 (June) 1932.

The authors report two cases of this exceedingly rare condition in two young infants of the same family. They were unable to flex the forearm, and passive motion in any direction was impossible. Both infants showed excellent physical development and no other anomalies. There were no syphilitic stigmas. The condition generally occurs in the female. The affected epiphyses showed marked atrophy, and the cartilaginous structures, early ossification. There is no satisfactory treatment for the condition.

Schlutz, Chicago.

Hernias and Diaphragmatic Malformations in the Infant. Pedro de Elizalde, Arch. argent. de pediat. **3**:340 (June) 1932.

The author observed this condition in an infant 4 months old. It had not gained weight well since birth, and occasional attacks of dyspnea and cyanosis were observed.

The roentgenogram showed a bilocular cavity in direct communication with the lower end of the esophagus. The cavity was median, supradiaphragmatic and retrocardial. A cavity was observed on each side of the chest. Evacuation of both cavities was easily accomplished; there was no retention. No stomach cavity was noted in the abdomen, the cavities in the chest evidently taking its place.

The case terminated fatally. There were much dyspnea, cyanosis and vomiting toward the end. No surgical treatment was attempted. Operative treatment is successful in about 41 per cent of the cases of this condition.

At autopsy the cavity observed in the thorax proved to be the stomach divided into bilateral portions by a consticting band. The herniation through the diaphragm took place in the region of the duodenum.

Schlutz, Chicago.

FAMILIAL MULTIPLE EXOSTOSIS OSTEOGENICA. OSCAR R. MAROTTOLI, Arch. argent. de pediat. **3**:397 (July) 1932.

The author reports two cases of this comparatively rare disorder, one in a boy of 4 years and one in a girl of 6 years. The upper and lower extremities were involved in both cases. Ancestors of both patients had had a similar pathologic condition of the bones.

Operative treatment is generally ineffective and is practically always followed by recurrence. In the lower extremities the bony exostosis and spicules are likely to injure the large blood vessels, especially if they occur about the upper end of the tibia or fibula. The disorder often causes considerable pain and limitation of motion. Operative procedure is the only measure which will give temporary relief.

SCHLUTZ, Chicago.

CONGENITAL PERINEAL ECTOPIA OF THE TESTICLE. MARCELO GAMBOA and HORACIO L. MONTARCE, Arch. argent. de pediat. **3**:592 (Sept.) 1932.

This unusual condition was found in an infant aged 2 months. Anomalies of the insertion of the gubernaculum testis and traumatic rupture have been ascribed as possible causes for its development. Treatment must be surgical. The gland will develop normally if the procedure is properly carried out.

SCHLUTZ, Chicago.

TWO CASES OF MALFORMATION OF THE ESOPHAGUS. SERAFIN FALCON, Arch. de med. inf. **1**:34 (Feb.) 1932.

The author found two cases of congenital malformation of the esophagus resulting in atresia among 4,000 new-born infants. The symptoms are vomiting, coughing and cyanosis. The vomitus does not contain gastric or duodenal residue. The prognosis is fatal. Treatment would have to be surgical. Jejunostomy seems preferable, at least theoretically.

SANFORD, Chicago.

TWO CASES OF ANORECTAL MALFORMATION. SERAFIN FALCON, Arch. de med. inf. **1**:46 (Feb.) 1932.

Two cases of atresia of the rectum are reported among 4,000 new-born infants. The prognosis depends on the degree of malformation. If there is a thin membrane, the prognosis is favorable. If there is no depression and the membrane is thick, the prognosis is grave.

SANFORD, Chicago.

REPORT OF A CASE OF ATRESIA OF THE DUODENUM AND OF THE DUCTS OF ADJACENT PANCREATIC LOBULES. FRANCISCO SUAREZ and EVELIO SALAZAR, Pediatria españ. **21**:683 (Aug.) 1932.

This extremely rare condition was found in a new-born infant who lived three days. The weight at birth was 2,000 Gm. The skin showed an icteric tinge at birth. There was no hepatic or splenic enlargement. The infant nursed but vomited all food or liquid taken. The abdominal observations at autopsy were of chief interest. The intestines beyond the duodenal portion were shriveled and atrophied and presented the appearance of a mass of worms. The duodenum showed complete atresia in its major portion and complete atresia of the pancreatic ducts leading from the adjacent lobes of the pancreas. The condition was probably of embryologic origin and in the nature of a malformation and was not due to an inflammatory process.

SCHLUTZ, Chicago.

CONGENITAL APLASIA OF THE PARIETAL PERICARDIUM. LUIS A. CHIODEN, Rev. Soc. argent. de biol. **7**:361 (July) 1932.

The author reports a case of this condition which is the sixty-eighth in the literature. This condition is not at all incompatible with life, as the author's case was found at autopsy in a man 64 years of age.

SANFORD, Chicago.

CONGENITAL DIAPHRAGMATIC HERNIA WITH A CHANGE IN THE POSITION OF THE STOMACH AND BOWEL. CHARLOTTE AUKERHOLD-HELLNER, Arch. f. Kinderh. **93**:303 (June 16) 1931.

A case of diaphragmatic hernia is reported. Roentgenograms showed the stomach to be in the left side of the chest with the ascending colon lying just to the left of the stomach. The left lung was markedly compressed, and the heart was pushed far to the right. Autopsy revealed a large opening in the left side of the diaphragm, through which, not only the stomach and large bowel, but the spleen and loops of small bowel had herniated into the chest.

LEMASTER, Evanston, Ill.

INFLUENCE OF MATERNAL NUTRITION ON THE DEVELOPMENT OF THE FETUS. P. JONEN, Arch. f. Kinderh. **98**:32 (Dec. 13) 1932.

In a previous publication, Jonen reported his experiments in which starvation of pregnant dogs uniformly resulted in absorption or extrusion of the fetus before the maternal supply of glycogen and fat was entirely consumed, and showed that the administration of food to the mother after pregnancy had been terminated would maintain her life. These observations contradict the widespread belief that if the maternal diet is inadequate, the fetus will withdraw its required nutritive materials from the mother's own body reserves until they are completely depleted. The author quotes the writings of physiologists, in response to von Pfaundler's criticism that starvation is an unnatural procedure. In answer to Döderlain's objections to his experiments the author states that his results agree with war time statistics, which revealed that undernourished women gave birth to smaller infants and showed a higher incidence of abortions, miscarriages and premature labors than well nourished women of other years.

LEMASTER, Evanston, Ill.

CONGENITAL CARTILAGINOUS RESTS IN THE NECK AND THEIR RELATION TO BRANCHIAL FISTULAS. H. NEIDEN and CLAUS ASBECK, Beitr. z. klin. Chir. **153**:47, 1931.

The authors present the histories of four cases of congenital cartilaginous rests in the neck; about seventy or eighty others have been reported in the literature.

These cartilaginous appendages are congenital defects and were described in early days as present in mythical animals. They are found in the same region in the neck in which congenital branchial fistulas are present. They consist of normal skin, epidermis, cutis, subcutis and a central nucleus of cartilage. This nucleus is bound to fascia of the sternocleidomastoid muscle and to fascia of the superficialis colli muscle.

The authors discuss the relationship of these remains to branchial fistulas and to cysts, and come to the conclusion that these appendages originate from branchial arches.

RUBIN, Boston.

CONGENITAL PARTIAL GIGANTISM AND ELEPHANTIASIS. FRITZ CLAR, Beitr. z. klin. Chir. **154**:178, 1931.

The author gives the complete history of the case of a man 33 years old who since birth had had increased growth and thickness of the left leg, especially of the foot and the ankle, with accompanying abnormal growth of the toes. Otherwise the patient was physically normal. Because of the increased length of the leg, the left buttock and hip were much higher than the right, with resulting lordosis, right scoliosis and torsion of the spine. The leg became gradually longer and heavier (30 cm. longer than the right). After freezing of the foot owing to exposure, and after multiple attacks of erysipelas, there was definite evidence of elephantiasis. Amputation was performed, resulting in recovery.

RUBIN, Boston.

PROGNOSIS OF CASES OF ATRESIA OF THE RECTUM. METU SANGAL, Beitr. z. klin. Chir. **155**:571, 1932.

The records of all cases of atresia of the rectum between 1902 and 1931 were studied.

Of thirteen patients with uncomplicated atresia, only two are living. All patients were operated on early, at from 1 to 5 days of age.

In sixteen complicated cases, six patients are alive, and six dead; the fate of four is unknown.

The results show that, of twenty-nine patients, eight are living. Other authors report higher mortality figures.

RUBIN, Boston.

AGNESIA OF THE GALLBLADDER. F. BARNSDORF, Frankfurt. Ztschr. f. Path. **42**: 304, 1931.

The literature on agnesia of the gallbladder is reviewed, and one new case is reported. The absence of the gallbladder was an incidental finding. The lower surface of the liver, where the gallbladder is situated under normal conditions, was perfectly smooth. The author concluded that agnesia of the gallbladder is clinically without significance.

SAPHIR, Chicago. [ARCH. PATH.]

INNER AND MIDDLE EAR IN CASES OF MALFORMATIONS OF BRAIN AND SKULL. B. G. TURKEWITSCH, Frankfurt. Ztschr. f. Path. **42**:415, 1932.

In a detailed article, the author points out certain correlations between the structures of the labyrinth and the brain. He believes that according to structural changes it may be possible to determine the time of the interruption of the normal development of the brain in cases of anomalies of the brain. Also, the changes in the brain per se may lead to certain conclusions as to what changes may be expected in the labyrinth. The author recommends experimental animal research by destruction of the brain in a very early period of the development and simultaneous investigation of the labyrinth in these instances.

SAPHIR, Chicago. [ARCH. PATH.]

A RARE MALFORMATION OF THE CORONARY VESSELS. I. LÖWENHEIM, Frankfurt. Ztschr. f. Path. **43**:63, 1932.

Both coronary arteries originated normally. The first portion of the right coronary artery up to a point about 2 cm. from its mouth was of normal width. Beginning from there, the lumen of this artery abruptly became much wider, measuring about 6 cm. in circumference. The dilated portion extended up to the region of the septum. At first glance, it seemed as if the dilated portion would end blindly. Close inspection, however, revealed that a small communication existed between the dilated end-portion of the right coronary artery and the right coronary vein. The latter also revealed a normal orifice and first portion. Its distal portion, however, which communicated with the distal portion of the right coronary artery, also was markedly dilated. Microscopically, neither the sections taken from the artery nor those from the vein showed significant changes.

SAPHIR, Chicago. [ARCH. PATH.]

ENERGY METABOLISM AND FOOD REQUIREMENTS OF THE PREMATURE INFANT. H. SCHADOW, Jahrb. f. Kinderh. **136**:1 (June) 1932.

The basal metabolism of the premature infant is lower than that of the normal infant; it is from — 10 to — 26.6 per cent in the first month, from — 4 to — 23.8 per cent in the second and from + 4.9 to — 15.1 per cent in the third. The specific dynamic action is from 5 to 10 per cent of that of the normal child. In view of this fact and of the slight muscular activity, the total metabolism is

less than normal, by from 30 to 46.6 per cent in the first month and by from 19 to 38.8 per cent in the second. Consequently, the caloric requirement is about from 100 to 120 per kilogram of weight.

CLAUSEN, Rochester, N. Y.

A PECULIAR FAMILIAL DEVELOPMENTAL DISTURBANCE (ACROCEPHALOSYNDACTYLISM). F. CHOTZEN, Monatschr. f. Kinderh. **55**:97, 1932.

The author gives a detailed description and discussion of an unusual developmental anomaly in a father and two sons, the chief features being deformity of the skull and syndactylism. Photographs, roentgenograms and diagrams of the skull of all three patients are presented, as well as many different measurements. There were innumerable symptoms of disturbance of the nervous system as well as retarded mental development.

GERSTLEY, Chicago.

METABOLISM OF PREMATURE INFANTS. HERBERT MORDHORST, Monatschr. f. Kinderh. **55**:174, 1932.

Studies of the metabolism of premature infants were made by the use of special apparatus which permitted varying the temperature. A distinct difference was noted between the premature and the full-term infant. As the temperature of the metabolism chamber was lowered, it was found that the metabolism of the premature infant increased on an average of 42.7 per cent, the full-term but debilitated child, 24.3 per cent, and the full-term, normal child, 27.6 per cent. During these experiments, the actual body temperature was reduced in the premature infant 0.9 C., in the debilitated infant, 0.6 C., and in the normal infant, 0.4 C. The foregoing figures represent averages, but individual determinations showed wide divergences.

GERSTLEY, Chicago.

PROGNOSIS AND PROPHYLAXIS OF PREMATURE INFANTS. A. REUSS, Wien. klin. Wchnschr. **44**:292 (Feb. 27) 1931.

From 1926 until the summer of 1930, the author observed 191 cases of premature children, of whom 99 died. The prognosis improved considerably when the birth weight was about 1,500 Gm.

Causes of death as ascertained by postmortem examination showed that four fifths of the children had bronchial pneumonia, and in three fourths of these the inflammation of the lungs was the direct cause of death. The clinical picture of this bronchopneumonia does not correspond to the well known type of infantile pneumonia. Physical findings are negative; there were scanty râles without bronchial breathing, but no dyspnea, cough or elevation of temperature. Pneumonia may be caused by aspiration and more often by influenzal infection, especially in the months from January to March. In many cases severe disturbances of nutrition undermine the health of the child, and pneumonia is only an accidental terminal phenomenon. The incidence of the occurrence of intracranial injuries is the same (according to the author) in both the premature and the full-term infant, but is more fatal to the premature child. Defective vitality is often a cause of death. Attempts of organotherapy, such as the injection of the female sex hormone, were made, but results are as yet uncertain.

Rational feeding is advocated as a most important prophylactic measure. A sufficient quantity of raw human milk was used until the end of the second month, in doses of 200 Gm. of milk for children up to 2,500 Gm. A sufficient intake of fluids is advised, supplemented by enemas of physiologic solution of sodium chloride if needed. More attention should be paid to cyanotic attacks, which may occur even in premature children free from intracranial injuries. Prophylactic treatment against rickets and anemia and as complete a protection against infectious diseases as possible are recommended.

ABT, Chicago.

RETENTIO TESTIS INGUINALIS (CRYPTORCHIDISM). J. PETRIVALSKY, Časop. lék. česk. **70**:629 (May 1); 669 (May 8); 709 (May 15) 1931.

The author discusses the comparative anatomy, embryology, development and complications of cryptorchidism and gives a review of the literature. Ectopic testes may be found rarely in the femoral, perineal or inguinoproperitoneal regions and in the penis or at the anterosuperior iliac spine. True retention, however, leaves the testis somewhere along the path from the abdomen to the scrotum. In the adult the ectopic testis rarely generates spermatozoa in any quantity. The temperature factor in spermatogenesis is discussed. The complications of an atypically placed testis are disturbed secretion, pain, malignant degeneration, torsion and injury. Operation is the treatment of choice although some authors recommend preliminary massage and attempts at lengthening of the vas. The author cites eleven cases, in ten of which the patients were operated on with a good result. The ages ranged from 4 to 40 years. The various operations are cited, but the author prefers his own modification in which the tunica dartos is separated from the skin and used as a tractor for the transplanted testis.

STULIK, Chicago.

SUPERNUMERARY KIDNEY. E. F. CHOCHOLKA, Časop. lék. česk. **70**:777 (May 29) 1931.

After a review of the literature the author considers only seventeen of the fifty reported cases as true instances of supernumerary kidney, the condition in the others being fused or double kidney. In a patient with hematuria two definite kidneys of approximately normal size were detected on the right side with the aid of intravenous pyelography.

STULIK, Chicago.

CONGENITAL ANOMALIES OF THE URETERS. OTAKAR SAITZ, Sborn. lék. **35**:303 (March 7) 1930.

The author reviews the literature and discusses the comparative anatomy, embryology and hypotheses of congenital anomalies of the ureter. Roentgenograms of various anomalies are shown. The anomalies are divided into anomalies of growth, openings and number. The first group includes deviations in length, width, lumen obliteration, diverticuli and ureter bifidus. Ureter duplex is a separate embryologic entity. The second group includes intravesicular and extravesicular, intra-urethral and wolffian body openings. The third includes ureteral agenesis and ureter duplex. The term double ureter is preferred to the term accessory ureter.

STULIK, Chicago.

Diseases of the New-Born

SUBCUTANEOUS FAT NECROSIS OF THE NEW-BORN: REPORT OF FIVE CASES. HOWARD FOX, Arch. Dermat. & Syph. **27**:237 (Feb.) 1933.

In this article the author presents five cases of subcutaneous fat necrosis of the new-born. Clinically, the condition is characterized by various-sized, deep-seated, indurated, bluish, painless areas in the subcutaneous tissue (usually on the back, extremities or buttock); by the appearance of these lesions from the second to the twentieth day of life; by the occurrence in infants born after a difficult labor (suggesting trauma, either during or soon after delivery, as the chief etiologic factor), and by a self-limited uncomplicated course.

Histologically, the lesions are characterized by limitation of the lesion to the subcutaneous tissue, by necrosis of fat cells and by infiltration with epithelioid and giant cells.

The author also discusses in detail the differential diagnosis (which includes sclerema adiposum, sclerema edematosum and scleroderma).

EKERMEYER, Iowa City.

COMPLEMENTAL FEEDING OF THE NEW-BORN INFANT. H. L. DWYER and F. C. NEFF, J. A. M. A. **99**:463 (Aug. 6) 1932.

The comparative gains of breast-fed newly born infants and of those given carefully controlled complemental feedings showed that the latter regained their birth weight more rapidly. Thirty-two per cent of the infants fed exclusively on the breast and 67 per cent of those given complemental feedings regained their birth weights on or before the tenth day. Careful regulation of complemental feeding so that it is never given when the breast supply is adequate or until the breast supply is exhausted had no adverse effect on the ultimate breast flow. Complemental feedings given freely or before the breasts were empty endangered the breast supply and favored early weaning. Infants of average weight (7 pounds [3,200 Gm.]) made satisfactory gains when 16 ounces (453 Gm.) of milk were consumed at the end of the first week. This equaled from 47 to 50 calories per pound of body weight.

BONAR, Salt Lake City.

DELIVERY OF A LIVING INFANT AFTER THE DEATH OF THE MOTHER. HENRY and PLASSE, Bull. Soc. d'obst. et de gynéc. **21**:556 (Oct.) 1932.

The mother of the infant was 30 years of age. She suffered from chronic cardiac valvular disease. She had previously delivered a healthy infant after eight months' gestation. Near term of the second pregnancy, just after the beginning of labor pains, an acute attack of pulmonary edema developed and she died very suddenly, at least forty-five minutes before the arrival of the obstetrician. The fetal heart sounds were then very weak and widely spaced. The cervix was dilated manually, and a version and extraction were performed quite easily, owing to the laxity of the tissues. The infant weighed 2,950 Gm.; he was cyanotic and apparently dead, but responded to artificial respiration. He vomited his feedings, and hypothermia, hematemesis and melena developed. He died at the age of 4 days. A report of the necropsy is not given. The literature on the subject is briefly reviewed.

GLASER, Rochester, N. Y.

FATAL SEPTICEMIA IN AN INFANT FOLLOWING TRAUMA DUE TO THE REPEATED APPLICATION OF FORCEPS. AUDEBERT, RIBAT and SOL, Bull. Soc. d'obst. et de gynéc. **21**:598 (Oct.) 1932.

The mother was a primipara, aged 28. The infant was delivered by a right occipitoposterior presentation. The forceps were applied three times, but they slipped off each time. Spinal anesthesia was administered, the forceps were again applied, and the infant was delivered without great difficulty. He seemed to be somewhat shocked but soon recovered. A suppurative process started in the soft tissues over the left mastoid region which had been injured by the forceps. Marked icterus developed after five days, followed by fever, and the infant died after an illness of seventeen hours. Necropsy disclosed only the lesions accompanying a septicemia.

GLASER, Rochester, N. Y.

GAIN IN WEIGHT OF A NEW-BORN INFANT WITH BRONCHOPNEUMONIA. AUDEBERT and PONS, Bull. Soc. d'obst. et de gynéc. **21**:636 (Oct.) 1932.

Measles developed in the mother of the infant, the rash having appeared three days after delivery. For eleven days the infant was breast fed by his mother; he presented nothing abnormal except a gradual fall in weight. On the twelfth day bronchopneumonia developed rapidly, and on that day the infant gained 6 Gm. in weight. For several days his condition was serious. Then the fever decreased, the pulmonary symptoms began to disappear, and the infant lost 100 Gm. over a period of two days. He then gradually began to gain weight, and at the age of 25 days was discharged, apparently well and weighing 3,100 Gm. The author states that gain in weight in new-born infants with bronchopneumonia has

been considered a grave prognostic sign, indicating massive pulmonary consolidation. Retention of urine and diminished excretion of water in the expired air are considered as contributing to the gain in weight.

GLASER, Rochester, N. Y.

ICTERUS GRAVIS NEONATORUM. GUSTAV MEYER, Arch. f. Kinderh. **98**:143 (Jan. 24) 1933.

Various theories concerning the etiology and pathogenesis of icterus gravis are discussed. The author reports one case in which sepsis appeared to be the cause. The clinical course and autopsy observations are described in detail.

LEMASTER, Evanston, Ill.

Acute Infections

APPENDICITIS IN MEASLES. I. DAVIDSOHN AND JACOB M. MORA, Arch. Path. **14**:757 (Dec.) 1932.

In two patients undergoing appendectomy two days before the appearance of the measles rash, large numbers of giant cells were found in the lymph follicles and subepithelial layers of the mucosa of the appendix. Only a few giant cells were seen in the appendix of a patient operated on two days after the appearance of the measles rash; while in a fourth patient, from whom the appendix was removed nine days after the appearance of the cutaneous eruption, no giant cells were evident. The authors conclude that the presence of the giant cells depends on the stage of measles during which the appendix is removed.

LEMASTER, Evanston, Ill.

JAMES BRYCE AND HIS TEST FOR PERFECT VACCINATION: A FORGOTTEN CHAPTER IN THE HISTORY OF IMMUNOLOGY. LUDVIG HEKTOEN, Arch. Path. **14**:837 (Dec.) 1932.

In 1802, James Bryce devised a simple method for testing the effectiveness of vaccination. He observed that in persons showing a vaccination reaction successfully producing immunity to smallpox a second vaccination performed a few days after the first produced a lesion of such rapid course that it very soon progressed to the same stage reached by the first vaccination lesion. This is considered to be the first test for specific allergy. Dr. Hektoen quotes many passages from letters and writings of Bryce, Jenner and other contemporaneous men who were experimenting with vaccination and observing its various manifestations and results. A short history of the life and work of Bryce is presented.

LEMASTER, Evanston, Ill.

ENDEMIC TYPHUS FEVER OF THE UNITED STATES. R. E. DYER, E. T. CEDER, A. RUMREICH AND L. F. BADGER, J. Infect. Dis. **51**:137 (July-Aug.) 1932.

In a complete and excellent article, Dyer and his associates demonstrate that the rat flea is probably the means by which the endemic typhus is kept alive and spread.

TOOMEY, Cleveland.

IMMUNIZATION TO SCARLET FEVER BY THE INUNCTION METHOD: A PRELIMINARY REPORT. EDGAR E. MARTMER, J. Pediat. **1**:555 (Nov.) 1932.

Scarlet fever toxin incorporated in an anhydrous wool fat base was administered to 155 children with a positive reaction to the Dick test by inunction for five treatments. After six months, 66 per cent of the children had negative reactions and in 34 per cent the reaction remained positive. There were no painful or severe reactions. Local reaction at the site of inunction occurred in 5 cases,

and a scarlatiniform eruption appeared in 1 case. This method has the advantage of ease of administration, lack of severe reactions and absence of the psychic factor involved in hypodermic injections. Further study of dosage and intervals between treatments is being done.

LEMASTER, Evanston, Ill.

CASE FATALITY OF COMMUNICABLE DISEASE. HAROLD B. WOOD, J. Prev. Med. **6**:87 (March) 1932.

Wood has studied the statistical reports of cases and the mortality from various communicable diseases in Pennsylvania. He concludes: "Case-fatality ratios indicate the completeness of reporting a disease and show the virulence of the disease. The following case-fatality ratios are approximately correct: diphtheria, 15 to 19 cases to 1 death; measles, 500 to 1; scarlet fever, 100 to 1; typhoid, 8 to 12 cases to 1 death; whooping cough, 125 to 150 cases to 1 death. Any state whose ratio of reported cases to recorded deaths falls much below those figures is obtaining very incomplete reporting, and therefore incomplete control over its quarantinable diseases."

TURNER, Chicago.

CURRENT PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES NOVEMBER 6 TO DECEMBER 3, 1932. Pub. Health Rep. **47:** (Dec. 23) 1932.

The incidence of influenza was from five to six times greater than in corresponding four week periods of recent years. The reported cases of poliomyelitis, smallpox, typhoid fever and diphtheria showed a substantial decrease as compared to previous years. Measles, meningococcic meningitis and scarlet fever occurred at the usual frequency for this season. The death rate from all causes in large cities rose to 11.1.

LEMASTER, Evanston, Ill.

CONGENITAL MALARIA. E. THONNARD-NEUMANN, United Fruit Co. Med. Dept. 20th Ann. Rep., 1931, p. 108.

A Colombian woman with malaria of the estivo-autumnal type gave birth to a premature infant weighing 1½ pounds (680.4 Gm.). Malarial parasites were found in the placenta, in blood from the umbilical vein at birth and in the blood obtained by puncturing the infant's ear lobe. The author states that this is the second case of congenital malaria to be reported in the American literature.

LEMASTER, Evanston, Ill.

THE DIPHTHERIA SITUATION IN THE BANES DIVISION. P. S. MALARET, United Fruit Co. Med. Dept. 20th Ann. Rep., 1931, p. 170.

Cases of diphtheria have been mild and relatively few in Cuba. Diphtheria is more common in Banes, Cuba, than in any other division of the United Fruit Company. It is suggested that the diphtheria bacilli in the latitudes of Cuba are normally nonvirulent, and that only under certain provocation do they become actively pathogenic.

LEMASTER, Evanston, Ill.

LESIONS OF THE PHARYNX IN ACUTE RHEUMATISM. A. D. FRASER, Arch. Dis. Childhood **7**:181 (Aug.) 1932.

This report deals with the histologic examination of the pharyngeal tissues and cervical lymph nodes of four patients who died of rheumatic fever uncomplicated by any other disease. Two patients (a man, aged 20 and a boy, aged 8 years) had had recurrent attacks of rheumatic fever. The other two cases (those of boys, aged 8 and 7 years) proved fatal during the first attack.

Rheumatic nodules were found in the pharyngeal tissues. These nodules were more commonly found in the vicinity of the tonsils, radiating from the tonsillar capsule into the connective tissue of the muscles of the pharynx.

Similar lesions were present in the region of the lingual and laryngeal tonsils in one of the recurrent cases. In this case also there were significant changes in the regional lymph nodes. These changes consisted of marked endothelial hyperplasia with much polynuclear and plasma cell infiltration.

Aschoff nodules were found in the connective tissue surrounding the vessels in the capsule and fibrous stroma of some of the nodes in the upper, deep cervical group on both sides.

KELLY, Milwaukee.

THE TRUE PLACE OF SERUM IN PROPHYLAXIS OF MEASLES. J. I. COLLIER, Brit. M. J. **1**:703 (April 16) 1932.

After a brief statement as to the epidemiology, periodicity and gravity of measles, the opinion is expressed that control must be effected through immunization. It has been shown by the work of several investigators that the consistently good results obtained with human serum have overshadowed those with animal serum. They conclude that the place of convalescent serum in the prophylaxis of measles is its use to insure a modified attack and only in exceptional cases to produce complete protection. The use of serum today is of little practical value in the control of epidemics of measles and in influencing the resulting mortality.

ROYSTER, University, Va.

A NOTE ON SCARLET FEVER FOLLOWING OPERATIONS IN THE NASOPHARYNX. ALEXANDER JOE, Brit. M. J. **2**:351 (Aug. 20) 1932.

The author draws attention to the frequency of scarlet fever following operations on the nasopharynx, stating that in his opinion and the opinion of others it follows tonsillectomy more frequently than any other condition.

He suggests for prophylaxis that all children should be given the Dick test beforehand, and that those with positive reactions should be passively immunized before the operation.

ROYSTER, University, Va.

TETANUS FOLLOWING IMPACTION OF FOREIGN BODY IN NOSE. DOUGLAS GUTHRIE, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 169, in Edinburgh M. J., October, 1932.

This fatal case of tetanus deserves notice because of the unusual entrance of the infection at the site of the foreign body embedded in the nostril. The removal of the body, which was a bead, showed an erosion of the tissues where it had been, and there was a slight nosebleed. At autopsy a sterile exudate was found around the cerebral hemispheres. There was no evidence of basal meningitis or of any infected tract from the nose.

NEFF, Kansas City, Mo.

RECENT DEVELOPMENT IN IMMUNOTHERAPY. LAWRENCE P. GARROD, Practitioner **129**:471 (Nov.) 1932.

The author describes therapeutic immunization under the grouping of two main headings: 1. Active immunization; this in turn is subdivided into: (*a*) Immunization by means of living bacteria; this method has proved of great value in the following diseases: smallpox, rabies, anthrax and cholera and the relatively new method recently tried with the use of B C G. A good discussion is presented concerning this method. (*b*) Active immunization again is attempted with considerable success by killed bacteria. The author feels that the comparative uncertainty of prophylaxis for colds and influenza is due largely to the multiplicity of bacteria concerned. He offers the use of vaccine for the treatment of pertussis as a good example in this subgroup. (*c*) A third active method is by means of bacterial products, particularly the use of neutralizing antitoxins. Diphtheria and scarlet fever are the only diseases under this grouping in which results have been successful.

2. Passive immunization; this is carried on by means of serums which are grouped under three divisions: (*a*) Antitoxic serums; the development of passive immunity by means of the use of toxoid and the use of toxin-antitoxin for immunization in scarlet fever are discussed. The author also briefly discusses the experimental work on antitoxin treatment for severe staphylococcic infections. (*b*) Under antibacterial serums, the author lists the serum used in the treatment of cerebrospinal fever as being of definite value, and he feels that a serum for the treatment of pneumonia may come under this grouping. (*c*) The use of convalescent human serums in measles and poliomyelitis is presented, as well as in mumps, chickenpox and postvaccinal encephalitis.

SAPPINGTON, San Francisco.

CUTANEOUS REACTIONS IN ACUTE RHEUMATISM. W. R. F. COLLIS, W. SHELDON and N. G. HILL, Quart. J. Med. **1**:511 (Oct.) 1932.

The authors present the results of cutaneous reactions observed in rheumatic and in nonrheumatic persons when tested with the extracts of various organisms.

They were primarily interested in the extract from a strain of hemolytic streptococcus isolated in 1930 from the throats of persons involved in an epidemic of tonsillitis and rheumatism at the Cheyne Hospital.

After reviewing the literature concerning skin tests in rheumatic children, the authors confirm the finding of Swift and others that the rheumatic child is more sensitive than the nonrheumatic child. Those with chorea were found to be the most sensitive. Reactivity was greatest during an acute attack of rheumatism and for six months following an attack (80 per cent). After six months, the sensitivity of the skin diminished. During fulminating carditis and in chronic cardiac failure there was reduced reactivity.

Age was found to be an important factor in determining the probability of positive reactions up to adolescence. There was an increase of reactivity to hemolytic streptococcic extract during childhood, and the curve ran parallel with the age curve for the positive tuberculin test, as determined by D'Arcy Hart in clinically nontuberculous subjects. When tested with extracts of two viridans streptococci and one gamma streptococcus, rheumatic children showed a higher percentage of strongly positive reactions to only one of the viridans extracts than did the controls.

Skin reactions of rheumatic children to tuberculin, Schick toxin and extracts from pneumococci, staphylococci, diphtheroid bacilli and Pfeiffer's bacillus did not show a higher sensitivity than did those of nonrheumatic children.

BRADFORD, Rochester, N. Y.

A FATAL CASE OF ENCEPHALITIS FOLLOWING VACCINATION. I. TRIVAS, Arch. de méd. d. enf. **35**:668 (Nov.) 1932.

On account of the excessive rarity of postvaccinal encephalitis in France, the author presents the following history of such an invasion:

In a baby, aged 4½ months, abscess of the right mastoid developed a few days after successful vaccination against smallpox; the left arm was greatly swollen, and an erythematous area surrounded three enormous pustules; the temperature was 105 F. The baby was operated on under local anesthesia, and convalescence seemed well established, when convulsions appeared and the temperature rose to 106 F.; the patient died in a few hours.

Spinal drainage was not practiced because of the sudden onset of neurologic symptoms and because of the unexpected termination. Trivas believes that the total absence of any signs of meningeal irritation at the time of operation and the freedom of the lateral sinus from the slightest involvement justify the suspicion at least of an encephalitis.

AMESSE, Denver.

RESISTANCE OF B. PERTUSSIS OUTSIDE THE ORGANISM AND ITS EPIDEMIOLOGIC IMPORTANCE. PAUL FONTEYNE, Rev. franç. de pediat. **8**:129, 1932.

The author found that the bacilli would live from thirteen to fifteen hours on material like a handkerchief or paper. In the presence of considerable saliva, this period was increased to between twenty-four and forty-nine hours. Cold of 3 C. (37.4 F.) increased their life to forty-four hours, while heat of 37 C. (98.6 F.) reduced it to six hours. In the presence of sunshine, the time is reduced to one hour. An emulsion of pertussis bacilli was vaporized and sprayed on a series of Petri dishes. The average length of life of the organisms at 22 C. (71.6 F.) was from five to eight hours; at 3 C., from thirty to forty-five hours, and at 37 C., from thirty minutes to six hours. While these experiments probably exceed any maximum of actual human contact, it clearly shows that whooping cough is much more contagious than is usually taught, because of greater resistance of the bacilli than was believed possible.

SANFORD, Chicago.

BEHAVIOR OF THE MICRO-MEINICKE REACTION WITH THE SERUM OF PATIENTS WITH DIPHTHERIA AND WITH DIPHTHERIA ANTITOXIN SERUM. LORENZ FENERSTEIN, Arch. f. Kinderh. **97**:26 (July 22) 1932.

The micro-Meinicke reaction with the serum of patients recovering from diphtheria was positive in fourteen of eighty cases. The reaction to the diphtheria antitoxin (horse) used for these patients was positive in twenty-eight of the eighty. Patients receiving micro-Meinicke reaction positive antitoxin showed a high percentage of positive reactions, but in some cases in which the patients had received negative antitoxin, the reaction to the micro-Meinicke test was positive. The author suggests that the amount, method of injection and reaction of the antitoxin influence the reaction of the patient's serum to the micro-Meinicke test.

LEMASTER, Evanston, Ill.

ENCEPHALITIS FOLLOWING GERMAN MEASLES. J. SIEGL, Arch. f. Kinderh. **97**:235 (Oct. 4) 1932.

On the fifth day after the onset of German measles in a 9 year old girl, headache, unconsciousness and convulsions occurred. After examination and observation in the hospital a diagnosis of encephalitis was established. Complete recovery followed in a few days. Although nervous complications of German measles are rare, the author mentions a few reported cases of psychic changes, polyneuritis, meningitis and encephalitis.

LEMASTER, Evanston, Ill.

FORMATION OF THE PSEUDOREACTION OF THE SCHICK TEST. J. SIEGL, Arch. f. Kinderh. **98**:1 (Dec. 13) 1932.

The author supports the view that the pseudoreaction to the Schick test may represent a specific as well as a nonspecific sensitization. In support of this view, it is shown that pseudoreactions are frequent in children who also show a positive tuberculin reaction, but are rare in children having a negative reaction to tuberculin, except during convalescence from diphtheria. As further proof is cited the fact that pseudoreactions may be seen in children who fail to give a nonspecific reaction to glycerin bouillon. The specific nature of the pseudoreaction is presumed to be due to a previous contact with diphtheria bacilli.

LEMASTER, Evanston, Ill.

A CASE OF BULLOUS IMPETIGO WITH SCARLET FEVER. HAROLD LOTZE, Dermat. Wchnschr. **94**:547 (April 16) 1932.

In an 11 year old boy an infection of the middle ear developed following an attack of influenza. Hemolytic streptococci were isolated from the discharge.

While the ear was still draining, scarlet fever developed with a typical strawberry condition of the tongue. Scarlet fever serum was given, and a pruritic serum rash developed. All of the areas were scratched, and severe bullous impetigo appeared which ran a stormy course for several weeks, leaving depigmented, slightly atrophic scars. Hemolytic streptococci as well as staphylococci were recovered from the impetigo lesions.

TAUSSIG, San Francisco. [ARCH. DERMAT. & SYPH.]

VACCINE TREATMENT OF WHOOPING COUGH. H. SEIFERT, Deutsche med. Wchnschr. **58**:1758 (Nov. 4) 1932.

The author treated eighty-seven clinic patients, of from 3 weeks to 3 months of age, all of whom suffered from whooping cough. At intervals of from two to three days he gave, intramuscularly, increasing doses of vaccine containing 4,000, 6,000 and 8,000 million organisms in a cubic centimeter. Most of the patients were in the beginning of the convulsive stage when treatment was started. The author found that the treatment had a beneficial effect on the duration and severity of the disease. He had no controls.

KERESZTURI, New York.

CLINICAL AND EXPERIMENTAL OBSERVATIONS ON SCARLET FEVER. ERICH HÄSSLER, Jahrb. f. Kinderh. **136**:129 (July) 1932.

The streptococcus must be regarded as the causative agent of scarlet fever. Immunity to the rash and toxic manifestations is established by an attack, but no immunity is acquired to other manifestations of streptococcic infection. The toxin is not a true ectotoxin, but rigid proof of the anaphylactic theory of its action has not yet been established. For diagnostic purposes, the blanching phenomenon is most practical.

CLAUSEN, Rochester, N. Y.

BLANCHING POWER OF SERUM OF ANIMALS INFECTED WITH SCARLET FEVER. KARL HEINZ HOFFKEN, Jahrb. f. Kinderh. **136**:351 (Sept.) 1932.

Guinea-pigs and rabbits received the blood of patients with scarlet fever but symptoms of the disease did not develop. The serum of rabbits which had received intravenous injections of serum from persons with scarlet fever develops the power of blanching the rash in man. The control experiments seem adequate.

CLAUSEN, Rochester, N. Y.

DEMONSTRATION OF THE VIRUS OF HERPES AND VACCINIA BY MEANS OF THE CORNEA OF THE RABBIT. K. HERZBERG, Jahrb. f. Kinderh. **136**:365 (Sept.) 1932.

This article is a polemic against Gasteiger and Niederwieser (*Jahrb. f. Kinderh.* **134**:184, 1932).

CLAUSEN, Rochester, N. Y.

DECREASING THE RISK OF PROTECTIVE VACCINATION. W. KOELZER, Jahrb. f. Kinderh. **137**:91 (Oct.) 1932.

Instead of four scratches, only one, from 7 to 10 mm. in length, should be made in the first vaccination. At the ages of 4 and 9 years, vaccination should be repeated with one or two incisions; and a third revaccination should be undertaken with four incisions at the twelfth year.

CLAUSEN, Rochester, N. Y.

THE PROPHYLAXIS OF SCARLET FEVER IN CHILDREN'S INSTITUTIONS. JOSEPH RIHA, Časop. lék. česk. **69**:1489 (Oct. 31) 1930.

The author reviews the current literature and cites the important points in the institutional care of scarlet fever as follows: reinfection from convalescent

patients with infected throats; the noneruptive or atypical case in which at times there is little more than a positive culture from the throat; the afebrile noneruptive case in which there are only angina and a positive culture from the throat; cases of erysipelas; otitis media; adults with peritonsillar infections and "carriers." The author's scheme is to place the patients with new cases in a ward and after eighteen days, culture material from the throats. In cases in which cultures give negative or mildly positive results, the patients are thoroughly bathed and placed in the second or cubicle section. After repeated negative cultures have been obtained, the patient is again thoroughly bathed and placed in the convalescent ward before full discharge from the institution. Acriflavine base and 2 aethoxy-6, 9 diamino lactate acridine, 0.5:1 Gm. per thousand cubic centimeters, were found most useful as a local antiseptic.

STULIK, Chicago.

EPIDEMIOLOGY AND PROPHYLAXIS OF PERTUSSIS. ALOIS GUTWIRTH, Časop. lék. česk. **70**:788 (May 29) 1931.

The author discusses the history and the gradual decrease in the epidemic proportions of pertussis and the decrease in deaths from this disease. In spite of this decrease, pertussis is still higher in mortality than the other infectious diseases. Pertussis appearing in the new-born on the second to the seventh day of life is considered congenital by some, but others report the onset of pertussis after an incubation period of merely several hours (Birk). The symptoms and progress of the disease are discussed. Droplet or spray infection is considered the mechanism of infection, especially during the early catarrhal stage. Epidemics have lasted from several months to more than a year, and the seasonal incidence has been variable in different series. The incidence is increased in the preschool period, being highest in several series during the second year of life. Various methods of treatment are discussed, including convalescent serum, serum of immunized animals, polyvalent vaccines and monovalent vaccines. In the prophylaxis several antigens have been used, including killed organisms in a series of six injections of doses gradually increasing to 6,000,000,000. In the group immunized in this way the morbidity was 4 per cent, and the mortality, 2.9 per cent. Kraus uses ether sterilized injections of saliva on the basis that a filtrable virus is the etiologic factor.

STULIK, Chicago.

Chronic Infections

A STUDY OF THE PATHOGENICITY OF THE BACILLUS OF CALMETTE-GUÉRIN (B C G). WILLIAM H. FELDMAN, Am. J. Path. **8**:755 (Nov.) 1932.

A strain of B C G (bovine origin) was obtained from Calmette and grown in glycerin broth potato medium, with subculture every four weeks. Four guinea-pigs given injections of this original culture showed no tuberculous lesions. After a time, the organism was transferred to a glycerin egg medium, with subcultures about every two weeks. Four guinea-pigs were inoculated with each subculture intracerebrally, intraperitoneally and subcutaneously, a total of fifty-eight animals. Tuberculous lesions were observed in eleven, or about 19 per cent. There is no evidence that the subculturing increased the pathogenicity, but the deaths were rather due to individual susceptibility. Material from the tuberculous pigs did not establish the disease on reinoculation. It cannot be accepted that the B C G strain is entirely innocuous.

MOORE, Cleveland.

INDUCTION OF AVIRULENCE IN PASTEURELLA TULARENSIS. LEE FOSHAY, J. Infect. Dis. **51**:280 (Sept.-Oct.) 1932.

Foshay showed that two strains of Pasteurella tularensis from two fatal cases in man lost their virulence for certain laboratory animals by prolonged cultivation on coagulated egg yolk at low temperatures.

TOOMEY, Cleveland.

TULAREMIA: ACCURATE AND EARLIER DIAGNOSIS BY MEANS OF THE INTRADERMAL REACTION. LEE FOSHAY, J. Infect. Dis. **51**:286 (Sept.-Oct.) 1932.

Foshay describes a skin test which gives an allergic skin response that is specific and reliable. It is similar to other skin tests.

TOOMEY, Cleveland.

TUBERCULOSIS IN CHILDREN AND ADOLESCENTS. H. D. CHADWICK, J. Michigan M. Soc. **31**:109 (Feb.) 1932.

After calling attention to the frequency of tuberculosis in childhood and to its pathology during this age period, Chadwick points out that it cannot be diagnosed by the criteria used in adult tuberculosis. He stresses the value of the tuberculin test and the roentgenogram. For the former he prefers the Pirquet method, as it involves no dilution of solutions, is a single test, employs scarification instead of injection by needle and gives only slightly less accurate results than the Mantoux test. The roentgen examination of children with a positive reaction to tuberculin is almost the only way of diagnosing the condition before râles and symptoms appear — when the period most favorable for treatment has passed. Two thirds of a series of one hundred and ten patients, whose cases were mentioned by Zacks, were exposed to the disease at home. Treatment should be aggressive, rest in bed combined with pneumothorax or phrenicectomy, depending on the extent and type of the lesion. The only real guide as to the type and effect of treatment should be the roentgenogram.

SMITH, Ann Arbor, Mich.

MASSIVE GENERALIZED TUBERCULOUS INFECTION IN CHILDREN WITH RECOVERY. LLOYD B. DICKEY and DOROTHY J. STARKS, J. Pediat. **1**:674 (Dec.) 1932.

Three cases in male children of heavy, generalized, tuberculous infection are reported, with apparent complete recovery in each. Primary factors in the recovery of such patients are removal from the contact and the institution of general hygienic measures. The disease may heal by absorption or calcification.

LEMASTER, Evanston, Ill.

INTERSTITIAL KERATITIS IN LATE CONGENITAL SYPHILIS. HARRY M. ROBINSON, South. M. J. **25**:956 (Sept.) 1932.

Interstitial keratitis is equally frequent in white and in colored people with late congenital syphilis.

A study of 144 patients with interstitial keratitis indicated that the diagnosis is often not made until irremediable corneal scarring has occurred. This may be due to failure to appreciate the importance of congenital syphilis in the etiology of this condition, to unfamiliarity with the common stigmas of late congenital syphilis or to failure to employ the Wassermann test of the blood as a routine diagnostic measure in such patients.

Adequate modern antisyphilitic treatment shortens the course of the acute inflammatory processes in interstitial keratitis, materially lessens residual corneal scarring, improves the ultimate visual acuity and lessens the incidence of relapse.

In interstitial keratitis which is originally unilateral, recurrence in the uninvolved eye may be prevented by adequate treatment in a high proportion of cases.

SCHLUTZ, Chicago.

ATROPHIC COARSE CIRRHOSIS OF LIVER IN A CONGENITAL SYPHILITIC. K. C. L. PADDLE, Brit. M. J. **1**:233 (Feb. 6) 1932.

In a report of this case the author states that the common cause of cirrhosis is alcohol, though he admits later that the exact causal agent is not known, as the

same causal agent does not always produce the same result. In the case reported, the patient had had scarlet fever at some time before. She had a positive Wassermann reaction, jaundice, enlargement of the spleen and slightly altered blood count. The course of the case is briefly described, and the postmortem observations are given. Though the patient's blood gave a strongly positive Wassermann reaction, no spirochetes were found after death in the liver or the spleen. The jaundice was a persistent feature, and throughout the course of the disease there were no hemorrhages.

The author suggests that the condition in this case bears a strong resemblance to Banti's disease, except from the standpoint of the blood picture.

ROYSTER, University, Va.

A COMPARATIVE STUDY OF CHEST RADIOGRAMS AND THE MANTOUX TEST IN CHILDREN. DOROTHY J. DOW and W. ERNEST LLOYD, Brit. M. J. **1**:701 (April 16) 1932.

The authors made a study of five hundred children, comparing the roentgen findings in the chests of these children with their Mantoux reactions. They have made a tabulated statement of roentgenologic criteria, in which they state what they consider to be abnormal roentgen findings in the chests of children. They then compare these roentgenograms with the Mantoux reaction, and state how many children showed positive tuberculin reactions and no pathologic condition demonstrable by roentgenograms of the chest. They tell how many showed a pathologic process in the chest and gave a positive intradermal reaction and, finally, the number whose roentgenograms showed a pathologic process in the chest and whose reactions to tuberculin were negative. Their conclusion is that one cannot say that abnormal findings in the chest are tuberculous without positive intradermal tests.

ROYSTER, University, Va.

BONE AND JOINT TUBERCULOSIS. W. C. WILSON, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 162, in Edinburgh M. J., October, 1932.

At a clinical meeting Wilson presented children, four of whom had been treated for tuberculosis of the spine; one had a tuberculous disease of both knees and two, tuberculosis of an ankle.

The feature of the treatment of the spinal caries is that no ambulatory care is employed, the patients being kept on the frame until the lesion is entirely healed. Two of the cases showed signs of cord compression, but these and practically all other evidence of spinal disease disappeared as a result of treatment.

In the cases of tuberculosis of the ankles the recoveries were complete as to function; there was in one case some residual atrophy of the calf muscles, as well as a certain amount of flatfoot.

NEFF, Kansas City, Mo.

TUBERCULOSIS IN CHILDHOOD: THE INCIDENCE OF BOVINE INFECTION IN VICTORIA. REGINALD WEBSTER, M. J. Australia **1**:315 (March 5) 1932.

From a study of eighty-one children and five adults the following conclusions were drawn: 1. Infection of the bones and joints, bronchial glands, lungs and meninges was always with the human strain. 2. Infection of the tonsils and cervical glands was with the bovine strain in 70.8 per cent. 3. Infection of the mesenteric glands was with the bovine strain in 100 per cent. 4. The bovine strain was never found except in the tonsils, cervical glands and mesenteric glands.

TENNEY, Madison, Wis.

OCCULT TUBERCULOSIS OF THE TONSIL IN RELATION TO TUBERCULOUS CERVICAL ADENITIS. REGINALD WEBSTER, M. J. Australia **1**:351 (March 12) 1932.

Histologic and bacteriologic studies were made on tonsils taken from children with cases of tuberculous adenitis. In 46.5 per cent of eighty-six cases of tuberculous adenitis, histologic or bacteriologic evidence of tuberculosis of the tonsils was found. In none of the patients with nontuberculous adenitis was such evidence found.

TENNEY, Madison, Wis.

MYOPATHY IN A PERSON WITH HEREDITARY SYPHILIS. L. BABONNEIX and GILBERT ROBIN, Bull. Soc. de pédiat. de Paris **30**:394 (June 21) 1932.

A boy, 14 years old, had difficulty in walking for the past two years. He had interstitial keratitis which improved under antisyphilitic treatment. He showed flaccid paralysis of the muscles of the upper and lower extremities, with involvement of some of the muscles of the trunk. Testing of the muscles by means of electrical stimulation revealed a hypo-excitability. The muscular weakness is considered to be due to atrophic myopathy as a result of syphilis.

BENJAMIN, Montreal, Canada.

JUVENILE DEMENTIA PARALYTICA. L. BABONNEIX and GILBERT ROBIN, Bull. Soc. de pédiat. de Paris **30**:397 (June 21) 1932.

A boy, 12½ years old, had been unable to keep up with his class in school for the past two years. There were an Argyll Robertson pupil in the right eye, exaggerated reflexes, underdevelopment of the testicles and positive Wassermann reactions of the blood and spinal fluid. He showed signs of beginning dementia.

BENJAMIN, Montreal, Canada.

CASEOUS NECROTIC AND DISSECTING BRONCHOPNEUMONIA. H. GRENET, R. LEVENT, ISAAC-GEORGES and MOURRUT, Bull. Soc. de pédiat. de Paris **30**:423 (June 21) 1932.

A boy, 6½ years old, died of a tuberculous bronchopneumonia, which involved the upper lobe of the right lung. The lobe had undergone caseation and cavitation almost throughout its entirety, but its vascular pedicle was intact as if it had been dissected out. In addition to these observations, necropsy revealed generalized miliary tuberculosis.

BENJAMIN, Montreal, Canada.

A PECULIAR FORM OF HEREDITARY SYPHILIS OF THE BONE IN CHILDHOOD. N. CONTAMIN and F. POUZET, J. de radiol. et d'électrol. **14**:603 (Nov.) 1930.

The authors observed two rather unusual cases of hereditary syphilis of the bone, in two girls, aged 5 and 8½ years. In both instances the process was localized to the metaphyses (in the first, in the lower metaphysis of the right femur, and in the second, in the lower metaphysis of the right radius), the epiphyses remaining entirely clear. The roentgen appearance was that of a vacuolar destruction of the metaphyses, with marked thickening of the epiphyseal line. The metaphyses as a whole were slightly enlarged, and there was some evidence of reactive periostitis. Following antisyphilitic treatment, healing ensued in both instances, though the roentgenograms several years later still revealed a densification of the metaphyses, with calcification and marked irregularity of the epiphyseal lines. The interesting feature of the two cases is that the lesion was localized to the metaphyseal region, producing a rather peculiar roentgen appearance. The condition must be placed either in the group of gummatous osteomyelitis or more probably in the group of disturbances in ossification. Complete healing is possible.

LEUCUTIA. [AM. J. ROENTGENOL.]

TREATMENT OF SEVERE TYPES OF CONGENITAL SYPHILIS WITH BISMUTH. E. LESNE and LINOSSIER-ARDOIN, Nourrisson **20**:261 (Sept.) 1932.

In addition to extensive lesions of the skin and mucous membranes, these cases present marked involvement of the viscera, particularly the liver. Experience has taught that too vigorous early treatment with the arsphenamines is sometimes attended with disastrous results. To avoid this the authors have used fat-soluble salts of bismuth with very gratifying results. The preparation employed was the camphocarbonate of bismuth, containing 0.01 Gm. of metallic bismuth per cubic centimeter. The average weekly dose has been 0.5 cc. (0.005 Gm. of bismuth) per kilogram of body weight. Clinical and serologic cures have been rapid.

McCLELLAND, Cleveland.

PROGRESSIVE ELONGATION OF ADHESIONS IN THE COURSE OF THERAPEUTIC PNEUMOTHORAX IN TUBERCULOUS CHILDREN. P. ARMAND-DELILLE, P. HECHTER and A. MAGRIN, Rev. de la tuberc. **13**:291 (March) 1932.

Earlier in their experience in the use of pneumothorax in children, the authors were of the opinion that in certain cases the existence of rather dense adhesions demanded surgical division to insure the success of this treatment. Later experience has convinced them that practically all such adhesions yield to air pressure and become so attenuated and elongated as to permit of satisfactory compression of the lung and obliteration of cavities if present. They present six cases, with roentgenograms, illustrating the progressive stretching of adhesions and healing of cavities in children ranging from 4 to 13 years of age.

SMITH, Ogden, Utah.

SHOULD CHILDREN WITH POSITIVE REACTIONS TO TUBERCULIN IN HOSPITALS AND CHILDREN'S HOMES BE ISOLATED FROM CHILDREN WITH NEGATIVE REACTIONS? FRANCONI, Schweiz. med. Wchnschr. **62**:961 (Oct. 15) 1932.

The author discusses the clinical histories of eleven children who apparently acquired tuberculosis while resident in hospitals and children's homes, and recommends that in such institutions three subdivisions be organized: (1) a section for patients with active tuberculosis; (2) a section for children with positive reactions to tuberculin in whom the disease is not progressive, and (3) a section for children giving negative reactions, to which may be admitted children from the preceding group after observation shows that no signs of activity are present. This arrangement is more necessary for infants than for older children, and is more necessary in homes and orphanages than in hospitals where there is little contact among patients.

WOLMAN, Philadelphia.

UNUSUAL CHANGES IN THE CENTERS OF OSSIFICATION IN A SYPHILITIC FETUS. LUIGI DE VECCHI, Radiol. med. **17**:575 (May) 1930.

The author found peculiar roentgen changes in the centers of ossification of the calcanei in a macerated fetus. The mother had suffered from florid syphilis during pregnancy; so the fetus was severely infected. The patient was born at seven months. The roentgen examination did not show the usual Wegner's osteochondritis or the periosteal inflammatory new-growths that are often seen in the syphilitic fetus. But in the centers of ossification of the calcanei on both sides there was a conglomeration of small points of calcareous opacity the size of pinheads, without any bone structure; they were not perfectly round, but semilunar. The whole group was stellate, running toward a central nodule which was more intensely opaque and with which the points seemed to be connected by delicate bridges. Normally the center of ossification of the calcaneus is partly ossified in the fourth month of intra-uterine life, and at the seventh month is lenticular, with a finely reticulate bone structure. Histologic examination in this case showed

that the structure of the center of ossification was still cartilaginous, with many very small, calcified areas. Apparently some rare kind of syphilitic dystrophy had retarded the development of the centers. MORGAN. [AM. J. ROENTGENOL.]

TREATMENT OF TUBERCULOSIS IN THE CHILD BY ARTIFICIAL PNEUMOTHORAX. ALFREDO BLAYA, Arch. d. hosp. de niños **3**:33 (March) 1932.

The technic of the production of pneumothorax in the child differs in no respect from that used for the adult. Roentgenologic control before and after the procedure is absolutely necessary. Cough and pleural irritation must be avoided. A centigram of morphine is given at the beginning of the procedure. It can be carried out in bed or on a table. The child must lie on the sound side, bolstered up with a pillow so that the intercostal spaces of the affected side are well spread. The apparatus used is the one described by Grass and is of very simple construction. Physical and roentgen examinations determine the point where the needle must be introduced.

SCHLUTZ, Chicago.

FREQUENCY OF BIOLOGICALLY PROVED CURE OF TUBERCULOUS INFECTION. H. OPITZ and K. KUNITZ, Jahrb. f. Kinderh. **136**:152 (July) 1932.

Intradermal tests for tuberculin were performed on 237 children in whom positive tuberculin reactions (of various sorts) had been obtained for from one to fifteen years previously at the Polyclinic of the University of Berlin. In only a single instance had the test become negative. The proportion of strongly positive reactions was no less than it had been on the previous occasion. The proportion of children with manifest active tuberculosis was the same in groups living in a home environment free from tuberculosis as in those living in a tuberculous environment. Children originally free from active tuberculosis tended to remain so.

CLAUSEN, Rochester, N. Y.

SEROLOGY OF SYPHILIS. E. MEINICKE. München. med. Wchnschr. **79**:375 (March 4) 1932.

Meinicke compared the several serologic diagnostic tests for syphilis. Research during the last fifteen years has brought serodiagnosis to a certain finality and high point of efficiency. The differences in the results with the various tests are only quantitative, that is, relative, even though they seem to be absolute. The practitioner will find the modern precise flocculation reactions the most satisfactory for diagnosis and for judging the effect of treatment.

BRAHDY, Mount Vernon, N. Y.

BLOOD PLATELETS IN TUBERCULOSIS. C. OESTERICH, München. med. Wchnschr. **79**:1794 (Nov. 4) 1932.

Oesterich found that the blood platelets were increased in tuberculosis. The counts ranged between 300,000 and 693,000 in all except one case of miliary tuberculosis and in two counts taken just before death. During the early stages of tuberculosis the counts were lower than when the lesions became more advanced. In cases of arrested or healed tuberculosis the platelet counts were usually within normal limits (between 100,000 and 350,000).

BRAHDY, Mount Vernon, N. Y.

THE CLINICAL OBSERVATION AND ELIMINATION DEPARTMENT AS AN ESSENTIAL PART OF A TUBERCULOSIS INSTITUTION FOR CHILDREN. C. NOEGGERATH and A. VIETHEN, Ztschr. f. Gesundhverwalt. u. Gesundhfürs., 1931, no. 23, p. 617.

The observation and elimination department was devised as a separate unit of the university clinics. It serves as a place for the examination and laboratory procedures conducted on children suspected of having tuberculosis. Full facilities are offered for the diagnosis of tuberculosis and for the study of each case to

determine the treatment suitable for each person. Of 943 children brought to this department, 104 were found to be nontuberculous, and 281 had an inactive form of tuberculosis which did not require hospitalization. The various types of tuberculosis found in the patients presenting themselves to this department are briefly discussed. This service has proved of definite value in directing the further care of tuberculous children, and has more than paid for the cost of its operation by eliminating the cost of hospitalization in those cases in which it was shown to be unnecessary.

LeMaster, Evanston, Ill.

Dermoluetin Reaction in Congenital Syphilis. Olga Valentova, Ceská dermat. **13**:91, 1932.

The author tabulates the results of 102 dermoluetin tests applied to children at the dispensary in Prague. First group: Children with clinical manifestations of syphilis and a positive serum reaction.

(*a*) No previous treatment, 4.

(*b*) Under treatment, 13.

Results of luetin reaction:

(*a*) 3 strongly positive (2 keratitis, gumma). 1 weakly positive (neurosyphilis).

(*b*) 10 positive (keratitis). 3 negative (keratitis chorioretinitis; idiot).

Second group: Children with positive serum and without clinical symptoms. All under treatment.

(*a*) 12 never had symptoms.

(*b*) 8 symptoms disappeared under treatment.

Results of luetin reaction:

(*a*) 6 weakly positive and 6 negative.

(*b*) 2 positive (cured keratitis), 4 weakly positive and 2 negative.

Third group: Children free from symptoms and with negative serum.

(*a*) Syphilis in parents and other children 50.

(*b*) 8 children whose conditions cleared up under treatment clinically and serologically.

Results of luetin reaction:

(*a*) 1 strongly positive (mother 4 plus). 2 weakly positive. 47 negative.

(*b*) 2 positive (healed gumma). 6 negative.

Fourth group: Normal children for control. All gave negative reactions.

The author considers the positive results in the third group as the most important and speaking in favor of the test that may help to clear the question as to whether or not to treat patients with latent congenital syphilis.

Spinka, Texarkana, Texas. [Arch. Dermat. & Syph.]

Internal Diseases

Occurrence of Sicklemia in the White Race. Samuel Rosenfeld and Joseph B. Pincus, Am. J. M. Sc. **184**:674 (Nov.) 1932.

A review of the literature of sickle cell anemia in the white race is presented. It reveals only one case in which there is no evidence of an admixture of Negro blood and another case in which the data are incomplete for such a conclusion. A third case, in a boy, 9 years of age, is reported; the patient's antecedents for at least five generations are known to be of the white race. Three generations show the sickling trait. It is concluded that a previous remote generation might have contained a Negro ancestor with sickle cells in the blood, and that the sickling trait was transmitted as a dominant mendelian character to the white descendants who had no external evidence of negroid features. The resemblance of sickle cell

anemia to congenital hemolytic icterus should be borne in mind. Sealed wet preparations observed for at least twenty-four hours should be utilized before a decision as to the presence or absence of sickling is made.

Logical reasons for expecting more cases of sickle cell anemia in the white race in the future are presented. A chart study, a photograph of a child's blood in sealed wet preparations and references are given.

HENSKE, Omaha.

ALBUMINURIA FOLLOWING EXERCISE: I. ITS INFLUENCE IN WOMEN AND ITS RELATIONSHIP TO THE NEGATIVE PHASE IN PULSE PRESSURE. FRANCES A. HELLEBRANDT, Am. J. Physiol. **101**:357 (July 1) 1932.

Following exercise the incidence of albuminuria increased from 14.8 per cent to 57.5 per cent. In subjects in whom excessive peripheral dilatation occurs, and in whom a deep and protracted fall in pulse pressure follows the cessation of exercise, the highest incidence of albuminuria following exercise is found. Two causes therefore may combine to permit leakage of albumin through the glandular endothelium: asphyxiation during exercise and sluggish circulation after exercise.

NOURSE, Cleveland.

ROENTGEN TREATMENT OF CHRONIC LEUKEMIA. KENNETH R. MCALPIN, ROSS GOLDEN and KATHERINE S. EDSALL, Am. J. Roentgenol. **26**:47 (July) 1931.

The authors present a series of twenty-four cases of myeloid and twenty-three cases of lymphatic leukemia, in which the youngest patient was 13 years. Their conclusions are as follows: Every patient is an individual problem, and a blood count should be made before each treatment. Small doses of roentgen rays for enlarged nodes and the spleen in the lymphatic type of leukemia, one area at a time being irradiated, and for the spleen in the myelogenous type are advisable. The patient should be treated regularly, at first, every week; later, when the response and susceptibility of the patient have been established, the period may be lengthened. Many patients do well with counts considerably higher than normal, but sometimes the cells will continue to decrease long after irradiation. An occasional platelet count is advisable, especially in the lymphatic type. Purpura is always a contraindication against irradiation. Although the prognosis is always unfavorable, it is often well to await the result of a few treatments before making a definite prognosis. It has been said that 10 per cent or more young cells in the myeloid type indicates a hopeless outlook; this may be true, but if this percentage is reduced by roentgenotherapy, the prognosis may be said to improve. The reduction in the percentage of abnormal cells is fully as important as the initial drop in the total count.

STULIK, Chicago.

OLLIER'S DISEASE, UNILATERAL CHONDRODYSPLASIA: REPORT OF A CASE WITH A REVIEW OF THE LITERATURE. RALPH S. BROMER and RUTHERFOLD L. JOHN, Am. J. Roentgenol. **26**:428 (Sept.) 1931.

In 1899, Ollier described a case of cartilaginous dystrophy in which the extremities of one side were mainly affected, resulting in a retardation of growth. The authors describe a case in a girl 2½ years of age, with a shortening of the left lower extremity, which was first noticed when she began to walk. The only familial factor was a short left index finger in a sister. The left femur was 2 cm. and the tibia 3 cm. shorter than the right. A review of the literature does not determine whether this disease, which is extremely disabling because of its unilateral retardation of the growth of bone, is an unusual manifestation of the condition known as hereditary deforming chondrodysplasia, as Keith, Stocks, Hale and others believe, or whether it is a distinct entity, as Ollier and others have claimed. The fact that Cleveland's case was under observation for a sufficient length of time to show that the affected long bones are growing and that the lesions are undergoing delayed ossification and spontaneous healing tends to support

Ollier's theory. The twenty-six collected cases are all similar, but, in spite of the fact that there is no clearcut differentiation from the large group of cartilaginous dystrophies, they seem to fall into a definite clinical group. A study of more patients from infancy to maturity and more experimental work may ultimately be of assistance in determining whether or not Ollier's disease is a separate entity.

STULIK, Chicago.

PERINEPHRITIC ABSCESS OF TWO AND ONE-HALF YEARS DURATION IN A CHILD, ASSOCIATED WITH MARKED ANEMIA. JEROME S. LEOPOLD and EMANUEL GLASS, Arch. Pediat. **49**:346 (June) 1932.

A case of perinephritic abscess of thirty months' duration is presented. The abscess was apparently hematogenic from a superficial furunculosis.

The authors point out that such abscesses are rare in children, and believe that thirty months is the longest duration reported.

Attention was attracted to the condition by unusual scoliosis, chronic illness with anemia, a suggestive mass in the right upper quadrant, indistinctness of the right psoas muscle and other roentgen evidence.

WADDELL, University, Va.

PUBERTAS PRAECOX IN A GIRL OF FOUR: AN ATTEMPT TO ESTIMATE THE FOLLICULAR AND ANTERIOR PITUITARY SEX HORMONES. CHARLES L. BENNETT, Endocrinology **16**:529 (Sept.-Oct.) 1932.

The author reports the case of a girl of 4 years who had menstruated regularly since the age of 4 months. Her breasts, which were well developed, became painful at the end of each menstrual cycle. Her osseous development was that of a child of 7 years. The left ovary was felt to be about the size of a small hen's egg.

Blood was tested for ovarian follicular hormone by a modification of the Frank test and for pituitary hormone by the Fluhmann technic. Estrin was found to be present in the proportion normally found in the normally menstruating woman, and the pituitary test was negative, as is usually found in normal women.

JACOBSEN, Buffalo.

INTRAPERITONEAL IRON IN THE TREATMENT OF SECONDARY ANEMIAS OF INFANCY. CLIFFORD G. GRULEE and HEYWORTH N. SANFORD, J. Pediat. **1**:315 (Sept.) 1932.

The intraperitoneal injection of colloidal iron is suggested as an effective method of giving iron to infants with marked nutritional anemia, especially when the peroral administration of iron furnishes difficulties. When this procedure was employed in rabbits, iron was constantly found in the Kupffer cells of the liver, and no harmful reactions were seen. The dosage in infants consists of 5 cc. of ferric hydroxide solution containing 8 mg. of colloidal iron given twice a week until eight injections have been given. Only a slight rise in hemoglobin occurred during the first month, but after this a rise of about 5 per cent was seen each week. One or two injections of whole blood alone produced more rapid but only temporary improvement. The combined treatment, consisting of whole blood given at first and colloidal iron given intraperitoneally over a period of four weeks, proved of decided value for fourteen infants with secondary anemia.

LEMASTER, Evanston, Ill.

ACUTE EPIDEMIC TRACHEITIS (PRELIMINARY REPORT). W. AMBROSE MCGEE, J. Pediat. **1**:453 (Oct.) 1932.

The clinical course of acute tracheitis in thirty-nine children is described. The number and similarity of the cases suggest an epidemic infectious process, somewhat similar to pertussis. The causative organism was not isolated. The symptoms and methods of treatment are discussed in detail.

LEMASTER, Evanston, Ill.

XANTHOMATOSIS (LIPOID HISTIOCYTOSIS): REPORT OF A CASE. JOSEPH C. SAVAGE, J. Pediat. **1**:491 (Oct.) 1932.

The author reports a case of the Schüller-Christian type of xanthomatosis, occurring in a 3 year old boy, who had multiple defects in the bones, exophthalmos and diabetes insipidus. Xanthomatosis is a disease of lipoid metabolism, with storage tumors of lipoid appearing in various organs, and includes Gaucher's disease, Niemann-Pick disease, diabetic xanthomas and the xanthomas of icterus and pregnancy, as well as the Schüller-Christian syndrome. The chief measures used in treatment have been thyroid and pituitary, a diet low in fat and roentgen therapy.

LEMASTER, Evanston, Ill.

CLASSIFICATION AND ETIOLOGY OF PURPURA HEMORRHAGICA. HAROLD W. JONES and LEANDRO M. TOCANTINS, M. Clin. North America **16**:181 (July) 1932.

The authors believe that the part played by thrombopenia in the pathogenesis of purpura haemorrhagica has been overemphasized, and that the terms "essential thrombopenia" and "essential thrombocytopenia" should be dropped. Purpuric manifestations may occur in the presence of a normal or an increased platelet count. The essential factors are capillary permeability and disease of the mucous membranes, with or without platelet deficiency.

The experimental injection of tuberculin results in increased capillary permeability. In tuberculous persons suffering repeated hemoptyses, the bleeding time is lengthened, and the capillary resistance test is positive in a large proportion of cases. When tuberculosis and purpura occur in the same subject, the symptoms of the latter condition may overshadow those of the former, and there is great likelihood of assuming that only one condition exists. The frequency with which active or inactive tuberculous infection is found in subjects presenting purpuric lesions is strongly suggestive of a causal relationship between the two conditions.

SMITH, Ogden, Utah.

DIAGNOSIS AND CLINICAL SIGNS OF RHEUMATIC HEART DISEASE IN CHILDREN. WILLIAM B. BREED, New England J. Med. **207**:530 (Sept. 22) 1932.

In the adult, the difficulty is largely a mechanical one and consists of the balance of innate heart muscle reserve, on the one hand, against cardiac damage and bodily activity on the other. In childhood, however, rheumatic heart disease is almost entirely a problem of infection. Tonsillitis appears so frequently in the histories of these children that it cannot be ignored as a factor. We must, therefore, look to the child rather than to the heart.

A case in which the patient presents migratory articular symptoms, fever, malaise, sore throat and leukocytosis (with an increase of polymorphonuclears) should offer no difficulty. If within a short time evidence of carditis presents itself, the diagnosis is secure. Clinical signs of cardiac damage may appear as late as from six months to a year after the onset of rheumatism.

Prolongation of the P R interval by electrocardiogram beyond 0.2 second indicates certainly that myocardial infection is still present and active. Rheumatic nodules are found in many of these patients.

Sydenham's chorea in any form, mild or severe, is still considered a rheumatic disease, and should be treated as such.

GENGENBACH, Denver.

JUVENILE RHEUMATISM: THE WORK OF A RHEUMATISM SUPERVISORY CENTRE. D. D. PAYNE, Brit. J. Child. Dis. **29**:169 (July-Sept.) 1932.

This is a report on 274 consecutive cases of rheumatism in juveniles who attended the Royal Waterloo Hospital Rheumatism Supervisory Centre in London. The cases are analyzed as to age, climate, family incidence, social environment, nutrition and contagion.

The work of the Rheumatism Supervisory Centre, in addition to diagnosis and disposition of new cases, consists in keeping under observation patients discharged from the hospital and those for whom institutional care was considered unnecessary.

Patients with fully developed cardiac valvular disease are referred to special schools where competitive games and drill are not allowed, and where a bus service to and from school is furnished.

LANGMANN, New York.

THE ERYTHROCYTE SEDIMENTATION RATE IN JUVENILE RHEUMATISM. N. GRAY HILL, Brit. J. Child. Dis. **29**:181 (July-Sept.) 1932.

A modified Fåhraeus procedure was used with the Westergren apparatus. Readings were taken at the end of one and two hours.

The erythrocyte sedimentation rate of rheumatic children in whom the disease was considered cured or at least quiescent was always low, often being below 10 after the first hour and 20 after the second. In children with active rheumatism the rate of sedimentation is rapid, and a rate of over 40:80 may be expected.

The most interesting readings are those which are below 35:68 and above 10:23, in spite of the patients' being apparently in a quiescent stage of the disease.

The sedimentation rate found in chorea may be difficult to interpret. It would seem that it tends to rise during the onset and early state of chorea, but that it may settle to apparently normal limits before the patient is well, in fact, while the movements are marked.

LANGMANN, New York.

CALCIUM THERAPY IN PEDIATRICS. EDWARD PODOLSKY, Brit. J. Child. Dis. **29**:188 (July-Sept.) 1932.

This paper contributes nothing new and appears to be merely a fusion of articles in the literature that mention calcium.

Rickets, tetany, celiac disease, nephrosis, chorea and edema are among the conditions considered.

LANGMANN, New York.

TWO CASES OF MELAENA CAUSED BY INNOCENT GROWTHS OF THE SMALL INTESTINE. HAZEL H. CHODAK GREGORY, Brit. J. Child. Dis. **29**:197 (July-Sept.) 1932.

The author cites two cases: The first one was that of a girl, aged 5 years, who first showed blood in her stools at the age of 18 months and later on several occasions up to the time of admission to the hospital. Physical examination revealed nothing abnormal except for anemia. A barium sulphate meal and sigmoidoscopy gave negative results. On laparotomy a cherry-sized tumor was found in the ileum about 10 inches (25 cm.) above the ileocecal valve. On pathologic examination, it proved to be a typical fibro-adenoma.

Another girl, aged 8 years, had attacks of abdominal pain with passage of mucus and blood by rectum from early infancy until the age of 4 years. No further attacks of melena occurred until six weeks before admission. Physical examination, a barium enema and sigmoidoscopy gave negative results. On laparotomy, a flat-ridged growth with an ulcerated surface was found in the small intestine 2 inches (5 cm.) above the ileocecal valve. "The segment of small intestine shows a raised thickened patch of mucus membrane. . . . The general outline is like that of a Peyer's patch. . . . Microscopically the thickening is due to an abnormal development of lymphoid follicles which lie between the muscularis mucosa and the muscularis."

LANGMANN, New York.

BLOOD GLUTATHIONE IN DISEASE. R. PLATT, Brit. J. Exper. Path. **12**:139, 1931.

The normal amount of glutathione present is from 30 to 50 mg. per hundred cubic centimeters, and this is present almost exclusively in the corpuscles. In the majority of pathologic conditions, including cystinuria, the glutathione of the blood

remains within normal limits, though in cases of disease of the liver it shows rather wide variations. In anemia and some cyanotic states, the ratio of glutathione to corpuscles is increased. Studies of myelogenous and lymphatic leukemia show that glutathione is a constituent of both types of white corpuscles. A large amount of glutathione is contained also in pus cells.

KUGELMASS, New York.

PHYSIOLOGY OF PROTEINURIA AND ITS CLINICAL SIGNIFICANCE. P. M. T. KERRIDGE and L. E. BAYLISS, Lancet **2**:785 (Oct. 8) 1932.

This paper is not concerned with the evidence on which the various theories are based, but with the underlying idea which is common to all of them; namely, a normal kidney can excrete a protein which is "foreign" or obnoxious to it.

Experiments were performed both on anesthetized cats and rabbits and on isolated kidneys of dogs, which were perfused with defibrinated and oxygenated dog's blood by means of a pump. The "pump-lung-kidney" preparations were made in duplicate, so that the two kidneys of one dog could be perfused simultaneously and independently, one kidney being used for experimental and the other for control purposes. Various proteins dissolved in a 0.9 per cent solution of sodium chloride were added to the circulating blood. Only proteins with molecular weights less than 68,000 were excreted. Proteins with larger molecular weights, including serum proteins of other species, were not excreted. Hemoglobin, with a molecular weight of 68,000, was peculiar in that it was excreted when its concentration in the plasma exceeded a certain value. Whether or not a protein is excreted by the kidney depends on its physical properties and not on its chemical nature or biologic origin.

LANGMANN, New York.

ACRIFLAVINE IN THE TREATMENT OF CERTAIN SEPTICEMIC INFECTIONS CHARACTERIZED BY INVASION OF THE JOINTS. LEON TIXIER, Arch. de méd. d. enf. **35**:569 (Oct.) 1932.

Clinicians agree that while many cases of articular involvement occurring in the course of infectious disorders can be frankly attributed to certain organisms, it is none the less true that it is difficult to classify other conditions in which the articular membranes react strikingly to some unknown agent. It is in these borderline cases that Tixier has occasionally secured excellent results from the intravenous injection of acriflavine. The following is an illustrative case among a series reported in considerable detail: A boy, aged 15, suffered from an acute pain, resembling that of rheumatism, in the right elbow and shoulder. There was a high temperature. Neither the temperature nor the pain was affected by the administration of sodium salicylate. Shortly afterward, there appeared pleuropulmonary congestion of the base of the right lung and iridocyclochoroiditis of the right eye. Cultures of the blood were negative. Five intravenous injections of trypaflavine, a total of 0.9 Gm., were given at intervals of twenty-four hours; in a short period all symptoms had disappeared.

The dangers of this drug as an irritant to the renal tissue of adults is pointed out, but Tixier believes that, in the dosage recommended, it is relatively safe in childhood.

AMESSE, Denver.

CRANIOHYPOPHYSEAL XANTHOMATOSIS (SCHÜLLER-CHRISTIAN DISEASE). E. LESNE, J. A. LIEVRE and Y. BOQUIEN, Arch. de méd. d. enf. **35**:598 (Oct.) 1932.

A case of this uncommon disease, first described by Hand, in 1891, and later classified by Schüller (1915) and by Christian (1919), is reported in detail.

A boy, aged 3½ years, had been in excellent health up to one year previous to the initial symptoms of the disorder described; his family history was completely irrelevant. The onset was characterized by polyuria, which persisted throughout the illness, and which was accompanied by such intense thirst that the child was known on several occasions to have drunk his own urine and once gasoline. There

was absence of sugar on every examination of the urine. After a rapid loss of weight, there was a fair degree of maintenance of nutrition. The patient presented the usual tetrad of symptoms: diabetes insipidus, exophthalmia, osseous imperfections of the cranium and retardation of development.

The amount of urine excreted daily varied from 2 to 4 liters; the specific gravity was 1.004, and there was continued absence of all abnormal elements. The usual signs of dehydration were present to an extreme degree, but xanthomatous areas could not be detected. Exophthalmia was not so prominent as in some cases reported, but nevertheless was apparent. Roentgenograms revealed the characteristic changes in the cranial vault, which were especially marked in the left occipital and frontal regions. Biopsy of a section from one of these lesions and staining with sudan III revealed elements the cytoplasm of which took an orange-yellow coloration, while polarization demonstrated the salts of cholesterol in the tissues. In the treatment of this patient, organotherapy was practiced by the nasal insufflation of the powdered posterior lobe of the hypophysis after the method of Choay; thyroid extract was also administered. Irradiation of the skull and insulin therapy were employed, and fats were eliminated from the diet. The patient is still under observation.

AMESSE, Denver.

THE BACTERIAL FLORA OF THE PNEUMOPATHIES OF INFANCY. R. STANKIEWICZ, F. PRZESMYCKI, J. KOLAGO and L. ZMIGRYDER, Rev. franç. de pédiat. **7**:324 (Oct.) 1932.

The authors made cultures from aspirations of liquid from the pulmonary parenchyma and pleura. In 143 cases, 95, or 66.4 per cent gave positive results; 76.8 per cent of the cultures yielded pneumococci, 10.6 per cent streptococci, 4.2 per cent Bacillus pfeifferi, and 4.2 per cent staphylococci. In the pneumococcus group, 36 per cent were type I, 7.8 per cent type II, 9.3 per cent type III, and 46.9 per cent group X. From these studies the pneumococcus must be considered the most frequent organism in both the lobar and the bronchial type of pneumonia in infants of from 6 months to 2 years. It is also found commonly until 6 years, but rarely under 6 months. Pneumopathies due to the pneumococcus must be considered as grave disorders, while those due to the streptococcus and to B. pfeifferi are, from the point of view of seriousness, assigned to second place. The most serious of all are those in which two or all of the organisms named are involved. In the pneumococcus group, under the age of 2 years, type I and group X were found with equal frequence. All types were found equally in bronchopneumonia. Cases due to type III had the most violent course, but those caused by type I and group X were the most frequently fatal.

SANFORD, Chicago.

GENERALIZED CALCINOSIS AND THE CALCIUM METABOLISM. D. MOGGI, Riv. di clin. pediat. **29**:987 (Nov.) 1931.

A case report is given of a girl of 2 years, living in a sparsely settled region of Italy about 2,300 feet (about 710 meters) above sea level. The family history was unimportant except that the father had epilepsy. The patient was the fourth child, and nursed the breast exclusively for ten months. The first teeth appeared at 8 months. The child began to walk at 20 months. At 2 years she had begun to say a few words.

Gastro-enteritis developed at 5 months, bullous impetigo at 8 months and intertriginous eczema of the axillae at 1 year. Following this the mother noticed in the gluteal region hard, painless nodules, the size of a small pea and not easily movable. These spread to the front of the thighs and down the legs. Slowly, cutaneous lesions began to appear in these region; all the lesions felt and looked like marble. The child also began to present difficulty in walking. Physical examination showed similar lesions of the arms and back. There was some underdevelopment of the muscles. No other noteworthy abnormality was

found on physical examination. No striking change in the condition of the child had occurred in ten months. Laboratory reports showed:

Tuberculin test	Negative
Wassermann test	Negative
Urine	Negative
Blood calcium	15.4 mg.
Blood phosphorus	4.15 mg.
Blood magnesium	3.35 mg.
Blood cholesterol	250 mg.
Calcium balance:	
Intake	1.846 Gm.
Output	
Stools	1.850 Gm.
Urine	0.092 Gm.
Balance	—0.096 Gm.
Electrical reactions:	
Anodal opening contraction	5
Cathodal opening contraction	5

Roentgenograms showed miliary deposits (probably of calcium) in subcutaneous tissues of the lower extremities and to a large extent in the tissues of the head, trunk and upper extremities. Biopsy showed calcium deposited in large fat cells. The blood showed no detectable photochemical property. The author discusses the possible etiologic causes of this condition.

HIGGINS, Boston.

CONTRIBUTION TO THE STUDY OF DWARFISM IN CHILDREN. A. FIORENTINI, Riv. di clin. pediat. **30**:541 (April) 1932.

The author reports the case of a boy, 14½ years of age, whose weight, measurements and proportions are those of a boy of 5 years. The boy was of normal size at birth, and his small size was not realized until he was 5 years old. Mentally, he was fairly normal, but sexually not developed.

The author believes that the dwarfism is to be explained on the basis of possible dysfunction of the thyroid, thymus and anterior pituitary glands.

HIGGINS, Boston.

ANATOMIC, CLINICAL AND STATISTICAL CONTRIBUTION TO THE KNOWLEDGE OF HYPERTROPHIC STENOSIS OF THE PYLORUS. G. CAREDDU and L. NICOLI, Riv. di clin. pediat. **30**:631 (May) 1932.

A boy, 4 weeks of age, who had typical hypertrophic stenosis of the pylorus, was operated on, but died the following night with high fever and exhaustion. At postmortem examination an accessory pancreas was found in the wall of the duodenum near the pylorus; this may be the etiologic explanation of the stenosis.

HIGGINS, Boston.

BLOOD GROUPS OF INFANTS. A. VENUTI, Riv. di clin. pediat. **30**:681 (May) 1932.

Of fifty infants between 17 days and 12 months of age, the blood group was found to be the same as that of the mother in twenty-nine cases and different in twenty-one cases.

The blood group of twelve babies was determined at different times during the first months of life; in no case did the group change.

In thirteen of twenty cases in which the baby's and the mother's blood were not of the same group, the baby's serum agglutinated the mother's cells.

The author sounds a warning against giving a transfusion of its mother's blood to an infant unless the bloods have been found to be compatible.

HIGGINS, Boston.

HYPEREOSINOPHILIA WITHOUT APPARENT CAUSE AND OF FAMILIAL DISTRIBUTION. P. MOLTENI, Riv. di clin. pediat. **30**:889 (July) 1932.

Eosinophilia was found by the author in the blood of seven members of one family. In the father, four sons and a nephew, eosinophilia varying from 6 per cent to 21 per cent was found. One niece showed 5 per cent of eosinophils in the blood. No definite cause could be found, and the author feels that the condition must be classified as familial.

HIGGINS, Boston.

MULTIPLE BONY EXOSTOSES WITH SEVERE COMPRESSION OF THE SPINAL CORD. V. BORRA and G. M. REVIGLIO, Riv. di clin. pediat. **30**:1000 (Aug.) 1932.

A girl, aged 11 years, had had multiple exostoses since birth. Two months before her entry into the hospital, she began to experience weakness and pain in the legs, especially in the left leg. The symptoms increased until she could not walk.

By the aid of roentgen examination of the spinal canal after the injection of iodized poppy seed oil 40 per cent, a diagnosis was made of transverse myelitis from pressure on the spinal cord of an exostosis from the fifth dorsal vertebra.

The exostosis was removed by operation, and the patient recovered completely.

HIGGINS, Boston.

PNEUMOCOCCEMIA WITH MULTIPLE LOCALIZATIONS IN A CHILD SEVEN YEARS OLD. JUAN CARLOS NAVARRO and A. F. AJA, Arch. argent. de pediat. **2**:356 (July) 1931.

The author describes the case of a boy 7 years old whose illness began with measles and was shortly afterward complicated by the development of bilateral lobar pneumonia. Both pulmonary processes were later complicated by the development of bilateral empyema, phlegmons of both thighs and a periumbilical abscess.

The authors consider that, while the phlegmons were undoubtedly hematogenous in origin, the periumbilical abscess may have been secondary to a localized peritonitis, also hematogenous in origin, in view of the presence of a painful distended abdomen early in the disease.

A pure culture of pneumococci was obtained from all suppurative foci. The treatment consisted of opening the individual abscesses and draining the empyema by means of a thoracectomy, which the author advises only when the patient's condition is fairly satisfactory.

A complete recovery followed without any sequelae in spite of the seven months' course of the disease.

SCHLUTZ, Chicago.

PARALYTIC ILEUS AS A COMPLICATION IN THE TOXICOSES OF INFANCY. M. T. VALLINO and F. DE FILIPPI, Arch. argent. de pediat. **3**:290 (May) 1932.

The condition occurred in an infant 2½ months old who was suffering from a severe gastro-intestinal intoxication with extreme dehydration. In the course of the illness, there developed paralytic ileus of such severe degree that an abdominal operation was undertaken for relief of the condition. The case terminated fatally.

The authors point out the difficulties in making a differential diagnosis in such a case. As a possible cause of the ileus they advance the theory of toxic lesions in the splanchnic system, which led to relaxation of the intestinal musculature and the secondary accumulation of gases and fluid in the bowel.

SCHLUTZ, Chicago.

TREATMENT OF KALA-AZAR IN THE CHILD. MARIANO BENAVENTE, Pediatria españ. **21**:358 (May) 1932.

The author reports the treatment in twenty cases of this serious disorder in children of various ages. The cure was successful in eleven cases. Various

antimony preparations are used. One of these is the *di*-ethyl-amine salt of *para*-aminophenyl stibiate. The preparation contains 42 per cent of pentavalent antimony. It is a yellowish powder similar to neoarsphenamine and is put up in ampules containing from 0.05 to 0.1 and 0.2 Gm. For use it is dissolved in a small quantity of distilled water. Twenty per cent of the drug in water forms an isotonic solution. It is used only intramuscularly. One injection is given daily for eight or nine days.

Although this remedy seems to be the preparation of preference in Spain, the author prefers the disodium sulphonate of brenzcathecin and trivalent antimony. The commercial preparation is an isotonic solution, each ampule containing 6.3 per cent of the powder in solution. One cubic centimeter of this solution contains 0.0085 Gm. of antimony. The author recommends weekly injections, given intramuscularly. The initial dose is 2 cc., which is increased until vomiting occurs. There are no local symptoms. The drug is cumulative, and serious damage to the liver may result.

SCHLUTZ, Chicago.

PRACTICAL APPLICABILITY OF THE ELECTROCARDIOGRAPH IN PEDIATRICS. PAUL VON KISS, Arch. f. Kinderh. **97**:72 (July 22) 1932.

The electrocardiograph furnishes valuable information on disorders of the heart which are difficult or even impossible to diagnose accurately by other means. It is of especial service in the diagnosis of arrhythmias and disturbances in the conduction system and in determining the condition of the cardiac muscle. Electrocardiographic aids from the prognostic and therapeutic standpoint are also discussed.

LEMASTER, Evanston, Ill.

FATAL SENSITIVITY TO SUNLIGHT CALLED FORTH BY ENTERAL PORPHYRIN. L. HARANGHY, Centralbl. f. allg. Path. u. path. Anat. **54**:161, 1932.

A 6 year old girl, who had a very slow convalescence from measles, was suspected of having tuberculosis and was given sun baths for one whole summer. The following spring these baths were resumed, but the child felt so ill after a short exposure that she was taken indoors and promptly felt somewhat better. An unusually severe redness of the exposed parts occurred shortly, and a cough developed. This was in turn followed by icterus and evidences of renal injury. Ten days after exposure to sunlight the child died, and a strain of Flexner's bacillus was cultured from the bowel. This organism was found to form porphyrin in hemoglobin-bouillon mediums. The intestinal bacteria were thus suspected of having formed this substance in the body, and the porphyrin led to a strong photodynamic sensitivity. Exposure to sunlight under these circumstances resulted in marked toxemia. The author cautions against the use of quartz lamps or sunlight in the treatment of persons with distress of the bowel and advocates testing the stool for porphyrin.

RUKSTINAT, Chicago. [ARCH. PATH.]

THE CIRCULATORY SYSTEM AND THE VOLUME OF CIRCULATING BLOOD IN SICK CHILDREN: II. THE PNEUMONIAS OF THE FIRST TWO YEARS. H. SECKEL, Jahrb. f. Kinderh. **136**:220 (Aug.) 1932.

In eleven cases of pertussis-pneumonia and in one case of measles-pneumonia, the volume of the blood was determined by a dye method. The cases were classified as follows:

I. Pulmonary (three cases). The skin is ruddy and not cyanotic; there are good muscle tone, no meteorism and little general disturbance. All of the patients recovered. The volume of the plasma was from 50 to 60 cc. per kilogram of body weight, the increase being proportional to the fever.

II. Cardiopulmonary (three cases). The condition may begin like type I. The skin is ashen or bluish and the liver large; there is meteorism. One child who was rachitic, died; the two others recovered. The plasma volume was normal or decreased.

III. Cardiovascular (three cases). The skin is bluish gray; the extremities are cold and cyanotic; the liver is enlarged; there is soft meteorism; the blood pressure is low; the pulse is rapid and feeble; the tendon reflexes are absent, and there is apathy. All of the patients died. The plasma volume was greatly diminished; there was from 36 to 42 cc. per kilogram of body weight.

IV. Cardio-atonic (three cases). The skin is waxy; dermatographia is absent; the pulse is rapid and feeble; the extremities are not cold and blue; the child is not so much exhausted as overwhelmed. The course is that of acute bronchiolitis. Venesection gives marked temporary benefit. The plasma volume is as high as 72 cc. per kilogram.

CLAUSEN, Rochester, N. Y.

RÔLE OF THE MUCOUS MEMBRANE IN THE CAUSATION AND TREATMENT OF SPASTIC PYLORIC STENOSIS OF INFANTS. STEFAN ENGEL, Kinderärztl. Praxis **3**:49 (Feb.) 1932.

The author considers spasm of the pyloric musculature as the prime cause of pyloric stenosis. However, the contraction of the muscle, in turn causing the mucous membrane of the pylorus to fold on itself and the rôle this folding of the mucous membrane has played in the production of the characteristic vomiting has been largely overlooked. Engel has demonstrated this characteristic folding by means of roentgenograms, and, even more conclusively, by postmortem examination of the stomachs of infants who have died of pyloric stenosis. At operation it is unnecessary to sever all the muscles surrounding the entire length of the pyloric canal; a moderately deep incision at the gastric end is sufficient to free the folded mucous membranes. There are nine excellent illustrations.

HUENEKENS, Minneapolis.

NOCTURNAL ENURESIS AND ITS LOCAL TREATMENT. WALTER K. FRÄNKEL, Kinderärztl. Praxis **3**:58 (Feb.) 1932.

Occult spina bifida and adhesions of the prepuce are of doubtful significance in the etiology of enuresis. The author contends, however, that infections of the bladder which are not demonstrated by urinalysis are a frequent cause. He reports fifteen cases in which he passed a ureteral catheter into the bladder and irrigated with a mild antiseptic solution. He also gave tincture of strychnine (from five to eight drops) three times a day for its tonic effect on the muscles. Permanent cure was obtained in all cases in about two weeks, with from two to three irrigations; in only one case were as many as five irrigations required.

HUENEKENS, Minneapolis.

ADVANCES IN CLINICAL KNOWLEDGE AND TREATMENT OF DISEASES OF INTERNAL SECRETION AND OF THE VEGETATIVE NERVOUS SYSTEM. RICHARD WAGNER. Kinderärztl. Praxis **3**:62 (Feb.) 1932.

This is an excellent review. It must be read in the original.

HUENEKENS, Minneapolis.

UREMIA RESULTING FROM PROLONGED VOMITING. PAUL MEYER, Klin. Wchnschr. **10**:155 (Jan. 24) 1931.

Referring to a report by Buschke (*Klin. Wchnschr.* **9**:1260, 1930) of a case of fatal uremia without urinary or renal changes, Meyer describes two other cases. Common to all of these were the prolonged vomiting, the increased nitrogen residue and the more or less complete failure of renal function without essential anatomic changes in the kidneys. In the author's cases there were also exsiccation and acidosis. In endeavoring to explain the functional pathology, the author refers to the French literature of recent years, in which has been described a uremic syndrome due to the loss of sodium chloride. He considers the likelihood of

functional impairment of the liver, which permits a vicious circle to develop. In one of the cases the administration of insulin, dextrose and physiologic solution of sodium chloride led to complete retrogression of all the symptoms.

SILVERMAN, Syracuse, N. Y.

GASTRO-INTESTINAL HEMORRHAGE IN PYLOROSPASM. S. ROSENBAUM, Monatschr. f. Kinderh. **54**:409, 1932.

The author reports seven cases in which gastric or intestinal hemorrhage was associated with symptoms of pylorospasm. Increased gastric peristalsis with projectile vomiting followed the hemorrhages. The association of these two symptoms has been noted before, but in this group of cases the peristalsis and the vomiting followed the hemorrhages. The writer argues clinically that duodenal ulcer may be an etiologic factor in polyrospasm.

GERSTLEY, Chicago.

GENERALIZED ENCHONDROMATOSIS. H. FERNBACH, Monatschr. f. Kinderh. **55**:1, 1932.

The author reports a case with photographs and roentgenologic findings of multiple enchondromas involving the entire skeleton of a 12 year old girl. The tumors were first noticed during the second year of life and gradually progressed during the next ten years. Death occurred from rupture of an unexplainable aneurysm of the abdominal aorta.

The diagnosis was particularly difficult owing to the possibility of an osteodystrophia cystica fibrosa and also to an incidental nonrelated generalized tuberculosis of the bones.

The final decision was made only by histologic examination post mortem.

GERSTLEY, Chicago.

DIAGNOSTIC DIFFICULTIES IN BEGINNING MITRAL INSUFFICIENCY IN CHILDHOOD. EUGEN HERGLOZ, Monatschr. f. Kinderh. **55**:15, 1932.

The diagnosis of beginning mitral disease is more difficult in childhood than in the adult because of several factors. Normally, the child's heart is growing as is his chest, while the relations are influenced by the fact that, in the child, the transverse diameter of the thorax is relatively greater than the anteroposterior. The chest wall is thinner, the intercostal spaces are wider and the diaphragm is relatively high. Again, the juvenile heart can assume a much greater load without hypertrophy than can the heart of the adult, and the child has no difficulties with the blood supply to the myocardium.

The writer surveyed the incidence of mitral disease in the schools of Budapest in the years 1931 and 1932. Of 21,795 children examined, 280, or 1.3 per cent, showed valvular defects. Of these defects, 172 were pure mitral insufficiency. The observations are of interest in that there was no case of broken compensation, and in only from 10 to 15 per cent were there complaints of cardiac symptoms.

The writer then discusses the difficulties of diagnosis of the condition and the various formulas and quotients, taking into consideration the growth of the body, thorax and heart and the difficulties of attributing any significance to the variety of systolic murmurs heard over the apex in so many children.

He concludes that the only reliable sign of a beginning mitral lesion is a roentgenogram, showing an enlarged auricle. The ordinary physical examination is valueless.

GERSTLEY, Chicago.

INVESTIGATIONS ON THE TECHNIC OF HEPATOLIENOGRAPHY. JOHANNES JOCHIMS, Monatschr. f. Kinderh. **55**:39, 1932.

Recently Radt and von Oka offered a method of making the liver and spleen definitely outlined under roentgen radiation. It consists of the intravenous injec-

tion of thorium dioxide, which is held in the reticular endothelial system in the form of tiny particles. The liver and spleen far more than the other organs of the body retain these particles and become opaque to the roentgen rays.

The writer tried this technic in animals and found that the drug was retained for many months in these organs although there seemed no ill effect. He then tried it in an imbecile infant. Here, too, the liver and spleen became sharply outlined as shown by accompanying roentgenograms. One year later the organs, though increased in size, were just as sharply outlined. No symptoms were noted.

In view of its prolonged retention the writer reserves a decision as to the practicability of the use of the drug in human beings, but believes that it will serve a purpose in animal experimentation.

GERSTLEY, Chicago.

SPLENOHEPATIC DISEASES IN CHILDREN. M. S. MASSLOFF, Ztschr. f. Kinderh. **53**:21, 1932.

Splenohepatomegaly occurs in 2.4 per cent of all diseases of childhood, but when chronic cases are excluded, the incidence falls to 1.2 per cent. In the 127 cases analyzed no etiologic factor could be assigned in 45. These included 15 cases of atrophic cirrhosis, 15 of hypertrophic cirrhosis, 10 of Banti's disease and 5 of congenital cirrhosis. Of the remainder, syphilis and anemia-pseudoleukemia were the etiologic agents in 23 cases each; tuberculosis, in 9; icterus haemolyticus, in 3; tumors, in 6; leukemia and pseudoleukemia, in 6; thrombopenia, in 7; leishmaniasis, in 4; chronic sepsis, in 4, and thrombosis of the splenic vein, in 1.

The cases were further analyzed as to the sex and age of the patient, familial predisposition and also possible causative factors in cases with no definite etiology. The chronic type of the disease was equally prevalent in both sexes and, with the exception of congenital cirrhosis, the age limits were between 3 and 16 years, the highest number of cases occurring between 10 and 16 years. It is more prevalent in families characterized by a weak constitution in which there are many deaths. Alcoholism was the cause of cirrhosis in 5 of the chronic cases, but in none of the cases of Banti's disease was alcoholism a factor. Although most of the patients had had an infectious disease at one time or another, no definite relation between these infections and the cirrhosis could be determined. In only 2 cases was there a history of trauma. Edema occurred in 40 per cent of the cases (1 case of Banti's disease). The stools in 50 per cent of the cases of atrophic and hypertrophic cirrhosis were normal in color. In one case of hypertrophic cirrhosis the stools were clay-colored. The stools of patients with Banti's disease were normal. The urine did not always show bile pigments nor were the reactions for bile always constant. Only 1 case of Banti's disease showed granular casts in the urine. The atrophic type tended to show more anemia than the hypertrophic. In Banti's disease the hemoglobin varied between 35 and 75 per cent; abnormal red cells were nearly always present. In the atrophic type there was a relative leukopenia, and in the hypertrophic type, a slight leukocytosis, and in Banti's disease there was leukopenia (first, lymphocytes predominate, then neutrophils; monocytes from 6 to 13 per cent) and occasional myelocytes and Türk cells. In the 23 cases of splenic anemia the ages of the patients were from 10 months to 31 months; there were 17 boys and 6 girls. The cases of syphilitic cirrhosis did not differ clinically from those of ordinary cirrhosis except for symptoms of syphilis and positive Wassermann reactions. Of the tuberculosis group (cardiotuberculosis or polyserositis), 1 case occurred in a 3 year old child; 3 between the ages of 5 and 10 years, and 5 after the tenth year.

The histopathology of the different forms of cirrhosis is discussed in detail and an attempt is made to explain the different clinical types of the disease by means of variations in histopathology and pathologic physiology.

SHELLING, Baltimore.

ROENTGENOLOGIC INVESTIGATIONS ON DISTURBANCES OF PASSAGE OF FOOD ALONG THE ESOPHAGUS. E. A. VOSS, Ztschr. f. Kinderh. **53**:200, 1932.

Abnormalities of the esophagus and disturbances in passage of food were studied by means of the roentgen rays. In congenital atresia with esophagotracheal fistula, the two cardinal signs are: meteorism of the intestines and the presence of the contrast medium in the stomach and along the bronchial tree. These signs are also present in atresia or fistulas occurring in later life, usually the result of erosion (as from acids and poisons).

Dilatation and elongation of the esophagus may easily be determined by roentgen examination. The author discusses the possible relation of idiopathic esophageal dilatation and of habitual "spitting" of young children to cardiospasm.

SHELLING, Baltimore.

CROUPOUS PNEUMONIA IN NURSLINGS. ST. ENGEL and T. DOXIADES, Ztschr. f. Kinderh. **53**:213, 1932.

The incidence of croupous pneumonia is greater than is supposed. Because of its mildness and because roentgenograms of the chest are not always available the disease is often not suspected. If carefully sought for, however, it may be recognized and differentiated from lobular pneumonia. The disease rarely occurs before the fourth month of life, although in a few cases it was suspected in the second and third months. The prognosis is favorable in the uncomplicated cases. Complications, however, are much more serious than in older children.

SHELLING, Baltimore.

Nervous Diseases

THE BRAIN PROBLEM IN RELATION TO WEIGHT AND FORM. HENRY H. DONALDSON, Am. J. Psychiat. **12**:97 (Sept.) 1932.

Are there any signs of functional capacity in the human brain post mortem? The neurons comprising the brain are constant within biologic limits, but "great" brains are regarded as composed of larger individual neurons. Grossly, the weight of the brain seems to be no index of mental capacity. The vascular tree, however, represented by the pial vessels is better developed in intellectual persons, apparently affording a better metabolic economy to the cortex, with resulting better performance. In a general way, while in the dead brain no functional capacity can be determined, one may infer that a large brain indicates good growth; therefore, it serves as a favorable sign of mental achievement.

JAHR, Omaha.

CRIME AND THE ENDOCRINE GLANDS. LOUIS BERMAN, Am. J. Psychiat. **12**:215 (Sept.) 1932.

The nature of the constitutional factor in crime may be traced to the endocrines which are generally concerned with personality regulation through their influence on metabolism. Defective endocrine function may be inherited through the genes in the chromosomes of the germ plasm. These defects are amenable to endocrine therapy as shown by studies of juvenile delinquents as well as of adult criminals including a number of recidivists. Endocrine tests on a large number of these social misfits have shown that from two to three times as many criminals and delinquents suffer from some sort of disturbance of the ductless glands as do the rest of the population. Certain types of dysfunction yield certain types of behavior patterns. Thus, in a study of 196 juvenile delinquents, pituitary deficiencies were found in 35 per cent, who were perennial thieves, precocious hoboes and habitual liars. The parathyroid deficiencies (30 per cent) produced persons who were given to impulsive assault and showed inability to learn normal social inhibitions. The thymus-suprarenal dysfunction (15 per cent) produced perverts and exhibitionists. Thyroid dysfunction (20 per cent) produced persons with emotional hysteria with uncontrollable tempers, lazy idlers and gang joiners.

The *Gestalt* conception on the causation of crime may be accepted on the basis of endocrine imbalance as the anlage, with sociologic (environment) problems, economic problems (unemployment) and psychologic factors (home conditions) as the immediate agents.

JAHR, Omaha.

MENTAL DISORDERS IN SIBLINGS. D. G. HUMM, Am. J. Psychiat. **12**:239 (Sept.) 1932.

This paper is a thesis the object of which was to study the various mental disorders including criminalism, manic depressive psychoses, dementia praecox, epilepsy and mental deficiency in siblings, with particular relation to hereditary and environmental factors in the causation of these disorders. Eight hundred and fifty-eight siblings of patients suffering from mental disorders were studied; 214 pairs of twins were also studied, one or both members of each pair being afflicted by mental disorder. Of these twins, 138 pairs were dizygotic and 76 monozygotic. Analysis and comparisons with other institutional diseases suggest that the closer the degree of genetic relationship to an affected subject the greater is the tendency toward mental disorder. In the twins judged to be monozygotic, the incidence of mental disorder was 93.5 per cent. Of 74 pairs of twins of opposite sexes both were affected in a ratio of 24.3 per cent. Of 401 siblings of the sex opposite to that of the person affected, the ratio was 17.1 per cent.

There was a very frequent familial coexistence of epilepsy with enuresis, migraine headaches and outbursts of rage. There was also a familial association between manic depressive states and cycloid personality. Sex is apparently a factor, the condition being of greater incidence in males than in females, but the incidence is higher in siblings of the same sex as the affected subjects than in siblings of the opposite sex. The numerous tables and detailed bibliography are a valuable contribution to the subject.

JAHR, Omaha.

BODY INTEREST IN CHILDREN AND HYPOCHONDRIASIS. DAVID M. LEVY, Am. J. Psychiat. **12**:295 (Sept.) 1932.

Several hundred children were studied with regard to their response to body parts. Eighteen of twenty children whose reactions are recorded yielded eighty responses showing special interest or sensitivity to their bodies. These were divided into two groups: (*a*) those showing six or more responses, and (*b*) those showing less than six, the former group being regarded as having excessive interest in the body. The results may be summarized thus:

Boys showed special sensitivity to weakness, shortness, thinness and a short penis. Girls showed sensitivity to facial appearance, hair, tallness and obesity. In preadolescents, boys showed more sensitivity to breasts and genitals than girls. Generally, the most frequent responses were to the visible mouth area, lips and teeth, and next, eyes and hair. Extraordinary physical points, favorable or otherwise, are described either with pride or resignation depending on the child's experiences incident to these traits, rather than on their sightliness or unsightliness. With scars, for instance, unsightly though they may appear, the more serious the occasion producing them, the greater is the pride of the owner (heroic duelist). Scars on or about the skull appear especially "valuable" judging from phantasying incident to the danger in their production. Illustrative cases are included.

JAHR, Omaha.

FREQUENCY WITH WHICH TUMORS IN VARIOUS PARTS OF THE BRAIN PRODUCE CERTAIN SYMPTOMS. FREDERIC ANDREWS GIBBS, Arch. Neurol. & Psychiat. **28**:969 (Nov.) 1932.

This is a study of the relationship of symptoms to the location of 1,545 verified cases of tumor of the brain. Each of twenty-seven symptoms is charted for tumors in fifteen locations. The report includes the relationship of tumors in

each location to age. Below 16 years of age, about 40 per cent are cerebellar, and nearly 20 per cent are about the fourth ventricle.

Generalized convulsions occur most frequently in cases in which the tumor includes the left parietal lobe. Visual hallucinations are most readily produced by the tumors that compress the occipital lobe. The study supports the previously expressed idea that projectile vomiting is not a general pressure symptom. Tumors that block the ventricular system are not markedly superior to all others in producing high-grade choked disk. These are but a few of the large number of valuable findings in this study.

BEVERLY, Chicago.

NERVE DEGENERATION IN POLIOMYELITIS: V. CORRELATION OF FIBER CHANGES IN NERVES WITH CELLULAR CHANGES IN THE SPINAL CORD. W. P. COVELL, Arch. Neurol. & Psychiat. **28**:1056 (Nov.) 1932.

This study of cell changes produced by poliomyelitis was made on monkeys. During the first forty-eight hours of paralytic symptoms of the disease the greatest cell destruction is in intermediate dorsolateral and ventrolateral groups.

More than half the cells in the intermediate dorsolateral and ventrolateral groups were destroyed in the first twenty-four hours of paralysis, and the number was gradually increased to more than 95 per cent by the fifth day. Nerve cell destruction continues during the latter stages, but in this series was not marked. Early changes of the cell bodies in the preparalytic stage can be recognized.

BEVERLY, Chicago.

ENCEPHALITIS DISSEMINATA; A CLINICAL AND ANATOMIC REPORT OF A CASE WITH FEATURES AKIN TO MULTIPLE SCLEROSIS AND DIFFUSE SCLEROSIS. JAMES C. GILL and RICHARD RICHTER, Arch. Neurol. & Psychiat. **28**:1072 (Nov.) 1932.

Pathologic studies of the brain of a man, aged 23 years, showed changes which are found in disseminated encephalomyelitis, multiple sclerosis and Schilder's disease. For this reason the authors conclude that all the conditions probably belong to the class of nonsuppurative, infectious encephalomyelitis.

BEVERLY, Chicago.

A NEW AND SIMPLIFIED MANOMETRIC TEST FOR THE DETERMINATION OF SPINAL SUBARACHNOID BLOCK BY MEANS OF THE INHALATION OF NITRITE OF AMYL. CHARLES A. ELSBERG and CLARENCE C. HARE, Bull. Neurol. Inst., New York **2**:347 (Nov.) 1932.

The effect of amyl nitrite on the spinal fluid pressure was studied. It was found that this drug produces a fairly uniform and consistent rise in pressure, beginning from five to fifteen seconds after inhalation is begun and averaging 162 mg. In complete and partial subarachnoid block, this rise is delayed, and the total rise is greatly reduced. The writer believes that this is a more sensitive and reliable test than jugular compression.

BEVERLY, Chicago.

THE EFFECT OF ROTATORY STIMULATION ON THE MOVEMENTS OF THE HEAD AND EYES IN NEWBORN AND YOUNG KITTENS. MURLAND W. FISH and WILLIAM F. WINDLE, J. Comp. Neurol. **54**:103 (Feb.) 1932.

Although the labyrinthine mechanism is sufficiently developed at birth to enable the kitten to right itself, which is necessary before it can crawl to the mother, it is probably immature; other vestibular reflexes do not appear until later. In the present study the postnatal development of vestibular function has been followed, and particular attention has been given to the ocular reactions which occur in response to rotatory stimulation.

Nine litters of kittens (thirty-nine animals), all of which were born in the laboratory, were examined; also several fetal kittens which were a week or less from term. One or both eyes were opened surgically by a slit in the palpebral membrane with a sharp knife on the day of the first observation, which was always on or before the third day after birth. Stimulation of the vestibular apparatus was accomplished by rotating the animals about the dorsoventral axis. Postrotatory nystagmus was looked for at the cessation of eight or ten rotations on a turntable, operated at about one turn per second. Other reactions of the animal, such as deviation of the head, were observed during and after rotation on the turntable.

The rotatory and postrotatory reactions appeared at the same time. Nystagmus was present in more than 75 per cent of the kittens on which operation was performed between the fifth and seventh days after birth. Deviation and irregular oscillating movements of the eyes appear a day or two before nystagmus, but some time later than deviation of the head, following rotatory stimulation. The nystagmus observed in young kittens is slow and follows a latent period. Characteristic adult responses appear before the end of the third week of life.

FRASER, Philadelphia. [ARCH. NEUROL. & PSYCHIAT.]

THE RÔLE PLAYED BY MASTURBATION IN THE CAUSATION OF MENTAL DISTURBANCES. WILLIAM MALAMUD and G. PALMER, J. Nerv. & Ment. Dis. **76**:220 (Sept.) 1932.

In 10 per cent of five hundred patients admitted to the Iowa State Psychopathic Hospital masturbation was found to play an important rôle in the development of the mental symptoms. These fifty patients were divided into group I, in which masturbation was the most important cause of the disturbance, group II, in which masturbation was only one of several factors, and group III, in which masturbation was only the precipitating cause of the mental disturbance. Cases are cited to illustrate these groups.

JAHR, Omaha.

TREMOR OF THE TONGUE IN TUMORS OF THE THIRD VENTRICLE: POSSIBLY A NEW SIGN. MAX H. WEINBERG, J. Nerv. & Ment. Dis. **76**:255 (Sept.) 1932.

This type of tumor occurs in children and young adults. In the author's series the oldest patient was 32 years of age; the youngest, 7 years. In another series mentioned, the youngest patient was 3½ years; the oldest, 26.

The general symptoms consist of headache, both severe and persistent, which is most intense in the morning. Choked disk may be moderate or marked. There are vomiting, diplopia and paralysis, with generalized reflex changes. The deep reflexes are greatly increased. Cerebellar signs are slow to develop, since the tumor is of the slow growing variety. Thus the general symptoms precede the focal signs, which differentiates this condition from tumors arising in the midcentral region or those developing in the subtentorium.

Tremor of the tongue was a constant sign in the author's series and is explained on the basis of the proximity of the tumor to the basal ganglions with pressure on hypoglossal fibers in the internal capsule.

JAHR, Omaha.

MENINGITIS CAUSED BY NONHEMOLYTIC STREPTOCOCCUS. KARL ROTHCHILD, J. Nerv. & Ment. Dis. **76**:360 (Oct.) 1932.

While practically all cases of streptococcus meningitis are fatal, there are some isolated cases in which the patients recover. This is the report of such a case. A railroad man, aged 28, had suffered from a griplike infection at intervals for about one year. Four days prior to his entrance into the hospital he suffered a sudden chill and severe pain in the occiput. Meningeal symptoms soon followed. Lumbar puncture showed increased pressure and a high cell count (10,000) in

a cloudy spinal fluid; the leukocyte count in the blood was 30,000; polymorphonuclears were 90 per cent. A culture of the blood showed a growth of low grade pleomorphic, nonhemolytic streptococci. The patient was given antimeningococcus serum for its nonspecific protein value rather than for its direct effect. Otherwise, the treatment was mainly symptomatic (spinal tap and intravenous injections of 500 cc. of a 5 per cent solution of dextrose twice daily).

JAHR, Omaha.

SOME FACTS ABOUT THE SO-CALLED NEUROPATHIC CONSTITUTION. ESTHER L. RICHARDS, J. Pediat. **1**:686 (Dec.) 1932.

Mental hygiene concerns itself with the assets and liabilities of a growing organism with a view to establishing the kind of environment and training which offers the given endowment its best chance of development. The inferior biologic development of the neuropathic person manifests itself in prolonged bed-wetting, night terrors, nail-biting, asthma, hay fever, eczema, tics, mucous colitis, easy fatigue, etc. Prolonged physical exertion, too great responsibility and strains of environmental functions cause such a person to bend and often to break. Careful planning and supervision of the daily life constitutes at least 50 per cent of the therapy. During childhood is the time to teach the neuropathic person how to live with his limitations without being self-conscious about them.

LEMASTER, Evanston, Ill.

THE SEASONAL INCIDENCE OF POLIOMYELITIS IN AND ABOUT CLEVELAND. JOHN A. TOOMEY and HARRY A. LIPSON, J. Pediat. **1**:739 (Dec.) 1932.

Toomey and Lipson studied 139 cases of infantile paralysis outside and 352 cases inside the Contagious Division of Cleveland City Hospital in the decade from 1921 to 1930. Notes were taken of the seasonal conditions, and official weather stastistics were consulted. Ordinary seasonal changes of temperature, dryness, precipitation, sunshine, etc., did not seem to have any effect on the morbidity due to infantile paralysis. There were decreased precipitation and normal or increased temperatures in all but one of the epidemic years. The majority of the cases of infantile paralysis occurred during August, September and October.

LEMASTER, Evanston, Ill.

TREATMENT OF ACUTE ANTERIOR POLIOMYELITIS WITH NON-SPECIFIC PROTEIN: A PRELIMINARY REPORT. C. L. THENEBE and V. P. CENCI, New England J. Med. **207**:880 (Nov. 17) 1932.

Two hundred and seventy patients were admitted to the Hartford Isolation Hospital during the year 1931: 7 during July; 119 during August; 96 during September; 37 during October; 8 during November, and the remaining 3 during December.

There were 94 preparalytic patients (23.9 per cent). There were 176 with demonstrable weakness or paralysis (65.2 per cent). There was a total of 16 deaths (5.91 per cent). One death occurred in the preparalytic group (0.37 per cent). The remaining 15 deaths occurred in patients with the spinal, bulbar and cerebral forms of paralysis (5.5 per cent).

Fever was present on admission in 87 per cent; diarrhea in 2 per cent; constipation in 2 per cent; drowsiness in 13 per cent; headache in 70 per cent; nausea in 53 per cent; vomiting in 45 per cent; circumoral pallor in 93 per cent; prostration in 13 per cent; restlessness, irritability and anxiety in 52 per cent; stiff neck in 93 per cent; stiff back in 83 per cent; sore throat as a complaint in 37 per cent; hyperemia and edema of the pharynx in 93 per cent and tache cérébrale in 93 per cent.

A total of 33 patients treated with intramuscular injections of sterile milk are reported on. Appreciable paralysis or weakness was noted in 6 per cent of these

patients during hospitalization. At a later examination slight weakness was noted in an additional 18 per cent. There was no mortality. The spinal fluid cell count varied from 10 to 310 cells.

GENGENBACH, Denver.

ANTERIOR POLIOMYELITIS: DIAGNOSIS, PROGNOSIS AND TREATMENT. FLOYD CLARKE, Nebraska M. J. **17**:283 (July) 1932.

The author states that the real cause of the disease is not yet known, and many of the problems are unsolved. An open mind is necessary toward the present methods of treatment. Fifty per cent of the cases are of the so-called abortive type. The germ is tenacious, but the virulence not necessarily great. Early diagnosis is important, and during the fall months the doctor should be "polio-minded." Rigidity of the neck is the most out-standing early symptom. The use of human convalescent serum, horse serum and normal blood serum is discussed.

HAMILTON, Omaha.

SOME PSYCHOLOGICAL PRINCIPLES UNDERLYING CHILD BEHAVIOR. HERMAN JAHR, Nebraska M. J. **17**:329 (Aug.) 1932.

Behavior is defined and described under nine headings—attention, imitativeness, curiosity, imaginativeness, hoarding, hero worship, superstition and love of adventure. The emotions such as love, hate, joy, grief, fear and jealousy are considered as etiologic factors in behavior problems.

HAMILTON, Omaha.

NOTES ON EXPERIMENTAL MENINGITIS IN RABBITS. S. E. BRANHAM and R. D. LILLIE, Pub. Health Rep. **47**:1683 (Aug. 12) 1932.

Rabbits given intracisternal injections of virulent meningococci showed clinical and histopathologic signs of meningitis. The same clinical and pathologic picture was produced by inoculation with filtered suspensions of meningococci. Boiled suspensions produced the same histopathologic changes but no clinical reaction. These findings suggest the important part played by the intoxication, as well as by the infectious process.

LEMASTER, Evanston, Ill.

CONVULSIONS IN INFANCY (SYMPOSIUM): PART I, STANLEY GRAHAM. PART II, NOAH MORRIS. PART III, BASIL RENNIE, Glasgow M. J. **117**:112 (March) 1932.

This is a symposium in three parts. In part I the clinical aspects of the various types are considered. The author states that the diagnosis of "convulsion" is a confession of ignorance. There is no difficulty in recognizing a convulsion. The historical review of the cause of increased convulsive tendency in infants is interesting. The first theory was immaturity of the nervous system in infants; later came constipation, gastro-intestinal upset, worms, teething, tonsils and other theories. The more recent theory of easily deranged calcium metabolism is one of the more convincing. He states that "the idea that the convulsion in infancy replaces the chill or rigor of the adult is untenable." He points out that calcium instability is not confined to rachitic children. An analysis of 500 cases of convulsions in infants showed that in 123 the convulsion had ushered in the infection or illness. Of these, 39 were cases of definite disease of the nervous system. The latter had no particular seasonal incidence, but the remaining 84 cases had a seasonal incidence which paralleled frank tetany, being highest in the winter months and at a minimum in the summer. Both showed definite rises in the periods from March to May and from October to December. In other words, the author believes that the greatest proportion of convulsions are due to disordered calcium metabolism, whether in rachitic or in nonrachitic infants.

Other types of convulsions mentioned are those in the new-born due to birth trauma or eclampsia of the mother, those due to diseases of the nervous system,

such as meningitis, encephalitis and mental defects, and so-called idiopathic convulsions. In treatment, hot baths, mustard baths, chloroform, chloral hydrate and similar remedies are given for immediate relief. In tetany calcium chloride and cod liver oil are advised.

In part II the physiologic action of the various basic ions in the serum is discussed, along with some determinations of serum calcium. It is concluded that the ionized calcium is the important factor in the prevention of convulsions. The action of calcium chloride in the treatment of tetany is through the acid radical causing greater ionization of serum calcium. Morris feels that the convulsions of gastric tetany are due to a relative increase in the sodium in the plasma, causing less ionization of the calcium.

Part III deals with the determination of the ionized calcium, the protein-bound calcium and the effect of amino-acids on blood calcium. Rennie concludes that the total serum calcium and diffusible calcium are reduced not only in cases of clinical tetany but in many cases with convulsions and no other evidence of tetany. The serum protein has no relation to convulsions, and influences only the protein-bound calcium, which is inert so far as neuromuscular activity is concerned. The injection of amino-acids intravenously into animals causes a definite fall in serum calcium. Thus, products of breaking down of protein can remove calcium from the blood stream and cause hypocalcemia.

SNELLING, Toronto.

HEAT THERAPY IN CHOREA. L. DE CASTRO FREIRE, Arch. de méd. d. enf. **35:** 527 (Sept.) 1932.

Discussing the danger and inconvenience frequently attendant on the use of phenyl-ethyl-hydantoin, as pointed out by numerous writers in Europe and America, Professor Freire, chief of the pediatric department of the University of Lisbon, cites his experience with a colloidal sulphur compound. Injections of this drug, which is also recommended in pertussis, are followed almost invariably by a rise of temperature, approximately from 103 F. to 104 F., but are not associated with any serious reactions or the formation of abscess.

Twelve cases in which the sulphur compound was given were divided into two groups, the first consisting of four recent cases of chorea and the second numbering eight cases of the chronic type of chorea, with relapse. In several of these cases the amelioration was so pronounced after the first injection that it was believed that the favorable results could be attributed fairly to the therapeutic agent employed; in other cases the condition was rather intractable. On the whole, the author feels that this drug acts similarly to phenyl-ethyl-hydantoin, but that it is much safer and does not require hospitalization of the patient.

AMESSE, Denver.

RELATION OF CONVULSIONS TO EPILEPSY IN INFANCY. G. HEUYER and J. DUBLINEAU, Arch. de méd. d. enf. **35:** 645 (Nov.) 1932.

For a period of twenty-seven months the authors kept under observation all epileptic children in their neuropsychiatric clinic and all others who gave a history of convulsions in infancy, whether or not followed by epilepsy.

In a group of children numbering 2,633, there were 475 who gave a history of convulsive seizures; in 334 of these, the syndrome developed before the age of 3, and in 141 after that time. In 97 of the first group, or 29 per cent, genuine epilepsy developed, and of these, 27 died before the age of 6; the remaining 70 continued with their epileptic attacks up to puberty, with the exception of 9 children, in whom the convulsions ceased at the age of 6.

A further group, numbering 100, or 30.6 per cent, presented psychic phenomena commonly attributed to epileptoid states; these included slow ideation, "mental viscosity," impulsive action, uncontrollable anger, enuresis, somnambulism and night terrors. The second roster of 141 children, in whom convulsive attacks developed after 3 years, was divided into 2 groups; those in whom the disease appeared

before the age of 7 (81 cases) and those stricken after this period (60 cases). Of the former class, 44 children became epileptic, and of the latter group, all were so classified.

The study was particularly intended to facilitate more accurate prognosis in the convulsions of infancy and childhood.

AMESSE, Denver.

AMAUROTIC FAMILY IDIOCY. LUDO VAN BOGAERT, J. SWEERTS and L. BAUWENS, Encéphale **27**:196 (March) 1932.

In presenting two cases of amaurotic idiocy, the authors comment on the paucity of studies of this sort in the French literature. The immediate genealogy of the two cases is well worked out. One patient, a girl, who died at 13 months, was the child of a woman whose brother was father to the other patient. One of the cases lacked the typical ophthalmologic modifications but presented the mental picture of idiocy. In both cases the syndrome of decerebration was completely developed (tonic attacks, tonic neck and labyrinthine reflexes, decerebrate attitudes, etc.). Between the tonic contractions there existed a general state of hypotonus, with intense reflex response to touch and hearing. Palmar and plantar reflexes were inverted, i. e., of a fetal stage of development. Also in one case certain rhythmic automatic movements suggested fetal movements.

ANDERSON, Los Angeles. [ARCH. NEUROL. & PSYCHIAT.]

ON THE PREDISPOSITION OF CHILDREN TO CEREBROSPINAL MENINGITIS. D. CAFFARENA, Scritti med. dedicati a Carlo Comba, ediz. Riv. di clin. pediat., 1929, p. 805.

This work represents a serologic study in which the author determined the agglutinating power against meningococci of the serums of one hundred and six normal children and sixty-three normal adults.

All of the serums possessed some agglutinating properties.

The maximum agglutinating property was present in the stronger concentrations of serum.

The serums of adults usually agglutinate in greater dilutions than do those of children, as shown in the following table.

Maximum Dilution Showing Agglutination

	Adults	Children
1– 25	0%	24%
1– 50	19%	47%
1–100	70%	25%
1–200	11%	5%

No one type of meningococcus was more commonly agglutinated than another.

HIGGINS, Boston.

NEUROPATHIES AND ANEMIAS. J. CARLOS NAVARRO and SARA DE ALZAGA, Arch. argent. de pediat. **3**:556 (Sept.) 1932.

Infants and children with neuropathies and anemias almost always present other disorders also, such as dystrophies or infections. Dietary modifications alone will not effect improvement. In every case, other forms of therapy must be added, for example antirachitic or antisyphilitic treatment, or treatment for endocrine disorders.

The authors believe that the symptoms begin to manifest themselves when the loss in weight of the infant exceeds 10 per cent of the normal weight.

SCHLUTZ, Chicago.

MYOTONIA CONGENITA. R. V. DIAZ, Arch. d. med. inf. **1**:15 (Feb.) 1932.

The author reports a case of myotonia congenita and presents photographs. He believes that this is the first case of this condition reported in Cuba. He confirms the findings of Moltchinoff and Versiloff of a high amount of blood creatinine and an increase of chlorides and urea in the urine. The patient improved under thyroid therapy.

SANFORD, Chicago.

A CASE OF HYDRO-ENCEPHALOMENINGOCELE. V. SANTAMARINA, Arch. d. med. inf. **1**:70 (Feb.) 1932.

This case is reported in a male child, whereas many authors consider this malformation to be most frequent in the female. Diagrams and complete autopsy findings are given.

SANFORD, Chicago.

ALCOHOLIZATION OF THE PHRENIC NERVE. PAUL MATTE LARRAIN, Rev. chilena de pediat. **3**:322 (Aug.) 1932.

Alcoholization of the phrenic nerve was carried out in a girl, aged 15. Subsequent to a typhoid infection, a tuberculous lesion developed in the right lung, with cavitation. Alcoholization of the phrenic nerve on the right side was undertaken. There was no particular postoperative result. Complete immobilization of the right side of the diaphragm was obtained, lasting for several months. There was complete recovery, with no untoward results from the procedure.

The author believes that this procedure is to be preferred to phrenicotomy.

SCHLUTZ, Chicago.

"JERKING THUMBS" IN CHILDREN. EDWARD FALK, Beitr. z. klin. Chir. **153**:559, 1931.

The author discusses the pathology and etiology of jerking thumbs.

In most cases there is a thickening of the flexor tendon or sheath. The nodule which is palpated in the region of the metacarpophalangeal joint has proved to be made up of loose connective tissue.

There are many theories as to etiology. The tumors may be of inflammatory, traumatic or congenital origin.

Operation and removal of these thickenings have resulted in disappearance of symptoms, i. e., (1) involuntary flexion and extension of the thumb, (2) pain during jerking and (3) a nodule in the region of the metacarpophalangeal joint.

RUBIN, Boston.

DISTURBANCES OF MOTILITY AND RESPIRATION IN MENTALLY DEFECTIVE INFANTS. A. PEIPER, Jahrb. f. Kinderh. **131**:129 (April) 1931.

Motor excitability is revealed in convulsions, "reflex" movements independent of external cause and isolated muscular twitching. Respiratory movements may also show great irregularity independent of obvious external cause; stimuli apparently spread from various motor centers to the respiratory center. Numerous graphic records are shown.

CLAUSEN, Rochester, N. Y.

PNEUMOCOCCUS MENINGITIS IN EARLY CHILDHOOD. EUGEN STRANSKY, Jahrb. f. Kinderh. **135**:82 (March) 1932.

In this article is presented the report of a case of pneumococcus meningitis in which recovery occurred and of another case in which hydrocephalus developed, causing death. At autopsy the pneumococci had disappeared.

CLAUSEN, Rochester, N. Y.

THE BARRIER BETWEEN BLOOD AND SPINAL FLUID IN INFANCY. MINORU TATSUMI, Jahrb. f. Kinderh. **135**:91 (March) 1932.

Sodium fluorescein, in 10 per cent solution, was injected intramuscularly; the spinal fluid was examined after from thirty to fifty minutes for the dye. The "barrier" is less efficient in younger children, as judged by the minimal quantity of dye per kilogram of body weight necessary to cause its appearance in the spinal fluid; the amount of dye was found to be 0.02 Gm. for infants under 3 months; 0.03 Gm. for those between 3 and 12 months; and 0.04 Gm. for children over 1 year of age.

CLAUSEN, Rochester, N. Y.

THE FACIALIS PHENOMENON OF THE CHVOSTEK SIGN. KURT HULDSCHINSKY, Jahrb. f. Kinderh. **135**:96 (March) 1932.

After examining about 4,500 children free from rickets and tetany, Huldschinsky concludes that the Chvostek's sign is so frequent as to be of no pathologic significance. In particular, no association was found with "neuropathy," anemia, former rickets, adiposity, endocrine disorders or paralyses.

CLAUSEN, Rochester, N. Y.

METHOD AND VALUE OF INSTITUTIONAL CARE FOR DIFFICULT CHILDREN. ERICH NASSAU and MILAN MORGENSTERN, Jahrb. f. Kinderh. **135**:308 (May) 1932.

In the Borgsdorf plan, herein described, forty "difficult" children are cared for in an institution together with about one hundred normal children. Special classes are arranged for the instruction of the backward children, and frequent conferences are held by the psychiatrist (*Heilpädogog*). The following disadvantages of the plan can all be met: "Psychic infection," as applied to imitation of motor disorders, discouragement of the difficult child by his normal companion and objections on the part of parents. The plan possesses the following advantages: A normal milieu is provided; opportunity is afforded for advancement; the personnel does not need to change, and no stigma becomes attached to the child.

CLAUSEN, Rochester, N. Y.

INFLUENCE OF CEREBRAL DISEASE ON THE GROWTH AND MATURITY OF BONE. KARL HOHENNER, Jahrb. f. Kinderh. **135**: 340 (May) 1932.

As a measure of the growth of bone, the author takes the height of the subject; as a measure of maturity, the roentgenologic appearance of the centers of ossification of the wrist and hand. Normal standards were determined; in any given subject, the age was plotted as abscissa; the deviation from the normal height in centimeters (L) or maturity in months (R) was plotted as ordinate. Obviously, L and R may be positive or negative. Clinical observations in group I, that of injuries affecting the brain before the second year, showed that L and R are both negative up to the second year and numerically about equal. After the second year, two subgroups must be distinguished: (a) oligophrenia (excepting mongolism), microcephaly and tumor, in which L and R are still negative, but R is more so; (b) mongolism, in which R becomes positive and L remains negative; epilepsy, in which there is a dissociation between R and L. In group II, that of injuries affecting the brain after the second year, the following subgroups are noted: (a) diseases of the cerebral cortex in which both R and L are negative, and (b) diseases of the basal ganglions, in which the values resemble those in epilepsy.

CLAUSEN, Rochester, N. Y.

TEMPERATURE OF THE CEREBROSPINAL FLUID IN SICK CHILDREN. M. TATSUMI, T. ASADA and T. KASAHARA, Jahrb. f. Kinderh. **136**:22 (June) 1932.

By means of a thermocouple, inserted through a lumbar puncture needle, it was found that the temperature of the spinal fluid is slightly higher than the axillary

temperature in the afebrile child, but that it is lower than the rectal temperature. In tuberculous meningitis, the temperature of the cerebrospinal fluid is slightly lower than the axillary temperature. In epidemic meningitis and therapeutic malaria it is higher. After drainage of fluid, the temperature usually rises.

CLAUSEN, Rochester, N. Y.

CONGENITAL HYDROCEPHALUS. G. POMMER, Virchows Arch. f. path. Anat. **282**: 456, 1931.

Prommer describes in minute detail the findings in the brains of eight infants with congenital hydrocephalus. In four the brain contained Verga's ventricle. In the fifth there was no Verga ventricle, but a slitlike space, the so-called ventricle of the septum pellucidum. Pommer discusses the theories of the formation of these fifth and sixth ventricles and subscribes to Hochstetter's view. Each of the five brains was the seat of an acute subependymal or diffuse encephalitis. Two of the eight cases were characterized by absence of the septum pellucidum, in one of which the hydrocephalus was associated with porencephaly. The eighth case was one of hydromicrocephaly with porencephaly due to congenital syphilis. The porencephaly is ascribed to perivascular hydrops about the syphilitically inflamed vessels. In substantiation of this mode of formation of the spaces about the vessels, Pommer adds two cases of acquired syphilis of the brain with perivascular hydrops.

SCHULTZ, Evanston, Ill. [ARCH. PATH.]

ANATOMY OF TUBERCULOUS INFECTION IN MONGOLS. W. STEFKO, Virchows Arch. f. path. Anat. **283**:99, 1932.

Stefko presents a study of tuberculosis as seen in 131 Mongols. From the context it appears that the Mongols were Siberians resident in Russia at the time of death. On gross anatomic grounds Stefko divides tuberculosis, as encountered in his material, into four types: (1) disseminated primary disease of the lung with early involvement of the vessels and secondary involvement of the serous cavities; (2) rapid progress of the process from the primary focus; (3) exacerbation of the primary focus with caseous pneumonia and generalization; (4) primary tuberculosis of the intestine with secondary generalization. He gives the gross and microscopic findings in a characteristic example of each type. Infection began as a bronchiolitis and peribronchiolitis, which spread rapidly and destroyed the local blood vessels. It was then disseminated throughout the lung. Hemorrhage was a frequent early manifestation. The characteristics of the initial stages are ascribed to structural peculiarities of the bronchial system, which Stefko promises to describe in another communication. He also postulates peculiarities in the structure of the pulmonary vessels that render the latter more susceptible to the destructive action of the infection. In every instance, the tuberculosis was of the infantile or adolescent type. There is a general discussion of the relationship of race and tuberculosis and of the effect of racial constitution and immunity on the course of the infection.

SCHULTZ, Evanston, Ill. [ARCH. PATH.]

ACID-BASE EQUILIBRIUM IN EPILEPSY. GEORGE VITEK, Sborn. lék. **36**:133 (Oct. 24) 1930.

A review of the literature is followed by a discussion of the etiology and pathogenesis of disturbances in the acid-base equilibrium in epilepsy. The author states that the concept of Bigwood on the preconvulsive alkalosis was not a constant finding. The blood serum p_H without other tests is not conclusive evidence of alkalosis. In epilepsy during gross convulsions there is a disturbed acid-base equilibrium. In a series of fifty cases in which both the blood and cerebrospinal fluid were observed, the alkali reserve was higher in the serum. Eleven of these were cases of essential epilepsy, and in none of these was there alkalosis, but in

one there was borderline acidosis. During a convulsion, elaboration of sarcolactic acid overcomes any preceding alkalosis, and is again overcome by the defense mechanism to equilibrium. In one patient with three or four convulsions a day, 105 mg. of acetone was given daily for ten days, with no effect on the convulsions, but the reaction changed from 64.7 per cent to 76.7 per cent (alkalosis). After ten days without acetone the reaction was 58.9 per cent, a borderline acidosis. Ketogenic diet is beneficial because it acts as a dechloridizer, and phenobarbital and other drugs act by raising the threshold for convulsive seizures and not through producing acidosis. As the number of seizures decreases through sedation, the defense mechanism is able to produce the acidosis which was attributed to the medication.

STULIK, Chicago.

NEUROLOGY IN THE FIRST YEAR OF LIFE. C. DE LANGE, Acta pædiat. **12**:276, 1932.

Two case reports are presented and discussed.

In a boy of 11½ months a coarse tremor of the left arm and leg, intermittent head-wagging and a tendency to incline the head to the left suddenly developed. Myoclonic twitchings also occurred in the left leg. He had had acute pneumonia at 10½ months and had recovered from the general symptoms of infection, although a few local signs persisted at the base of the left lung. The condition was interpreted as an acute cerebral tremor of toxic origin; it disappeared after about five weeks.

Another infant had a severe attack of acute anterior poliomyelitis at the age of 9 months, during which there was practically complete paralysis below the cervical cord segments. The symptoms improved, and the patient lived to be a little more than 3 years old, when he died of an acute nutritional disturbance. The histologic abnormalities of the old poliomyelitic process are reported in detail. It was noteworthy that the degree of muscle function observed before death exceeded that which one would have expected from the severity of destruction of the anterior horn cells that was found.

MCINTOSH, New York.

Diseases of the Ear, Nose and Throat

A DEFINITE SIGN PATHOGNOMONIC OF PARANASAL SINUSITIS: PRELIMINARY REPORT. MAUD LOEBER, A. J. MCCOMISKEY and W. F. HENDERSON, J. Pediat. **1**:565 (Nov.) 1932.

A roughly triangular swelling of the portion of loose skin beneath the outer third of the lower lid over the malar prominence is pathognomonic of a pathologic process in one or more paranasal sinuses of that side. This has been confirmed by rhinologic as well as by roentgenologic examination. Disappearance of the sign is coincident with local improvement of the sinuses involved.

LEMASTER, Evanston, Ill.

ACUTE NONDIPHTHERITIC LARYNGEAL OBSTRUCTION: A REPORT OF FIFTY-ONE CASES TREATED AT THE HARTFORD ISOLATION HOSPITAL DURING THE PAST SIX YEARS. C. L. THENEBE, New England J. Med. **207**:740 (Oct. 27) 1932.

The pathologic process embodies hyperemia and edema of the involved region. The edema is often of a rapidly increasing type. A period of sixteen hours from the onset to death has been observed. An exudate or membrane is only rarely present. The fat child with a short neck seems to be more prone to develop this infection. The voice sounds are usually present.

Fifty-one patient with this condition were admitted to the hospital; thirty-eight were males and thirteen females. The distribution according to age was as follows: from 8 months to 2 years of age, twenty patients; from 2 to 5 years

of age, fourteen; from 5 to 10 years, thirteen; from 10 to 20 years of age, three; above 20 years, one. The temperature on admission varied from 100 to 105 F. Six patients were admitted on the first day of illness, with one death; eighteen on the second day, with two deaths; eighteen on the third day, with two deaths, and nine on the fourth day or over, with two deaths.

In twenty-three cases in which intubation was not performed, there was no mortality; in four cases in which intubation was performed without tracheotomy, one death occurred (a mortality of 25 per cent); in twenty-one cases in which intubation and tracheotomy were performed, five deaths occurred (a mortality of 23.8 per cent); in three cases in which tracheotomy was performed without intubation, one death occurred (a mortality of 33 per cent). The total mortality of the entire group was 13.7 per cent. The total mortality of the intubated and tracheotomized patients was 25 per cent.

Analysis of the age in the fatal cases showed: 9 months, one case; 13 months, two cases, and 14 months, 21 months, 3 years, and 7 years, one case, respectively.

Tracheotomy should be performed early before the child is exhausted from prolonged dyspnea.

GENGENBACH, Denver.

ELECTROCOAGULATION OF TONSILS: SOME CLINICAL, PATHOLOGIC AND BACTERIOLOGIC OBSERVATIONS. R. GRAHAM BROWN and J. V. DUHIG, M. J. Australia **2**:1 (July 2) 1932.

In seven cases in which electrocoagulation of the tonsils was performed, it was necessary to enucleate the remaining tissue. Electrocoagulation had failed to destroy the tonsils completely; the remaining tissue was not sterile; relief from clinical symptoms had not been obtained, and the procedure had proved tedious and not without considerable pain.

GONCE, Madison, Wis.

SOME ASPECTS OF TONSILLITIS AND TONSILLECTOMY IN GENERAL MEDICINE. REGINALD MILLER, Practitioner **129**:521 (Nov.) 1932.

The author points out that during the present century much emphasis has been laid on chronic infection of the tonsils as a source of constitutional ill health and systemic disease and, hence, the tendency to wholesale or indiscriminate removal of tonsils. The influence of septic tonsils and the value of removal in certain conditions are discussed in detail.

The general picture of subnormal health in children in whom is seen loss of weight, appetite and color and the development of excessive fatigue, irritability and nervousness may be greatly benefited by the removal of infected tonsils. The author stresses the point that failure to obtain complete and permanent return to good health after tonsillectomy may be due to a chronic intestinal toxemia based on the primary tonsillar sepsis.

With regard to colds and catarrhal conditions of the nose and throat, Miller believes that tonsillectomized children are much better protected as compared to those with septic tonsils, but there is no reason to believe they are better protected than children who still have healthy tonsils. The value of tonsillectomy in the condition of asthma and juvenile rheumatism is also presented.

SAPPINGTON, San Francisco.

THE TREATMENT OF ACUTE AND CHRONIC TONSILLITIS. J. F. O'MALLEY, Practitioner **129**:531 (Nov.) 1932.

Under the heading of acute tonsillitis, the author discussed the simple catarrhal form, the acute follicular form and peritonsillitis. The treatment of the first form represents that used for the common cold. For the follicular type, treatment aims to diminish any further toxic invasion of the tonsil and also to stimulate elimination to remove toxins circulating in the blood. The author uses a single applica-

tion of an 80 per cent solution of silver nitrate to the tonsils to obtain the first objective, and he believes that causing free perspiration is of great value in effecting the elimination of toxins.

The indications for and the technic of surgical treatment for peritonsillitis are also discussed.

The relation of acute tonsillitis to certain complications, i. e., respiratory obstruction, acute rheumatism, otitis media, recurring earaches, deafness and acute mastoid disease, is given careful consideration.

Under the division "chronic tonsillitis," the forms of follicular, hyperplastic and tuberculous tonsillitis are presented.

SAPPINGTON, San Francisco.

THE COMPLICATIONS OF THE COMMON COLD AS THEY AFFECT THE EAR, NOSE AND THROAT. A. LOWNDES YATES, Practitioner **129**:546 (Nov.) 1932.

In a clearcut presentation, Yates states that complications of the common cold arise with such rapidity it is of great value to recognize the symptoms that are their precursors. The findings of pain, alteration in the character of the nasal discharge, malaise and fever are of prime importance in the diagnosis of all complications.

The author's conclusions bring out the more important points of the paper:

The common cold is devoid of complications except under the following circumstances:

1. When the discharges are confined within a sinus or within the middle ear by reason of the swelling of the mucous membrane, which interferes with drainage.

2. When there is secondary infection from contact with a person who is carrying in his nose micro-organisms that have learned to resist the natural destructive powers of the nasal mucus and thus to live and multiply within.

3. When the mucus in the nose is diluted either by nasal douching or by bathing.

4. When the common cold affects a person who is in ill health.

The complications of the common cold are found: (1) within the nasal sinuses. They are diagnosed by the presence of pain. They are relieved (*a*) in the early stages by cocainization of the nose, thus effecting drainage, and (*b*) in the later stages by washing out the sinuses with liquid petrolatum. (2) Within the ear. Acute otitis media is treated by myringotomy. The sooner myringotomy is performed, the quicker the recovery. (3) Within the larynx and bronchi. Laryngeal and bronchial complications are treated by sprays of liquid petrolatum, which aid the cilia in conveying the excess of mucus through the trachea and larynx.

SAPPINGTON, San Francisco.

ADENOIDS. F. PIERCE STURM, Practitioner **129**:560 (Nov.) 1932.

In this article, the author deals exclusively with the adenoids. He describes carefully the embryologic development and anatomy. In regard to function, the author states that the adenoids act as a test organ for respiratory fluids, i. e., the inspired air current and the systemic blood. In this capacity they take samples of all atmospheric micro-organisms and also prepare immunizing substances. Another function attributed to the adenoids is the manufacture of hormones in connection with the endocrine system.

Under the etiology of hypertrophy, Sturm places heredity as a predominating factor in about 50 per cent of cases. Syphilis, tuberculosis and rickets apparently are not causal factors. Cases are distributed equally among breast-fed and bottle-fed children, and also between the sexes. The author believes that, apart from heredity, the predisposing factors of improper food and foul air are of great importance. In regard to the relative frequency of hypertrophied adenoids and hypertrophied tonsils, in a series of 572 patients operated on by the author, 15 had enlarged tonsils only, 282 had enlarged adenoids only, and in 275 both were hyper-

trophied. The treatment recommended is surgical removal, and the author, after using the La Force adenotome in more than 3,000 consecutive cases, believes that it is the most efficient instrument available. A detailed description of the technic, including diagrams, is given.

SAPPINGTON, San Francisco.

THE SUBMUCOUS RESECTION OF THE NASAL SEPTUM IN CHILDREN. MACLEOD YEARSLEY, Practitioner **129**:581 (Nov.) 1932.

The author presents a series of seven cases, including one girl and six boys ranging in age from 10 to 14 years, in which he did a submucous resection of the nasal septum. The indications for operation were two or more of the following complaints: chronic catarrh, marked nasal obstruction, night terrors, increasing deafness, frequent colds, mouth breathing and asthma.

One of the cases was seen eight years later, and two were seen ten years later. The author points out that the scar tissue forming the new nasal septums in these three cases was as hard and as resistant as bone.

Excellent results were obtained in all cases, and from his experience the author believes that the operation is a valuable and justifiable procedure in children.

SAPPINGTON, San Francisco.

ACUTE MASTOIDITIS WITH INCIPIENT THROMBOSIS OF THE LATERAL SINUS. DOUGLAS GUTHRIE, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 169; in Edinburgh M. J., October, 1932.

This child, aged 7 years, did not have the usual febrile reaction, although there was pus in the ear and the mastoid was tender. When at operation the bone was removed, a large abscess was encountered, and pus spurted out. The lateral sinus was exposed, but found covered with a layer of granulation tissue. The sinus was not opened, but radical mastoidectomy was performed because of middle ear destruction and the presence of cholesteatoma. Such an operation is not often necessary in a child under 12 years.

NEFF, Kansas City, Mo.

FURUNCLE OF THE EAR CLOSELY SIMULATING MASTOIDITIS. DOUGLAS GUTHRIE, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 170; in Edinburgh M. J., October, 1932.

The clinical condition, in the child presented, simulated acute mastoiditis, and the ear was discharging and tender. But the groove which remains apparent behind the ear in mastoiditis was obliterated in the furuncle by the swelling; movement of the jaw or ear caused pain, and with the aid of a small speculum the normal membrane could be seen beyond the furuncle.

NEFF, Kansas City, Mo.

THE ADENOID HABITUS AND CALCEMIA. CONCEPCIÓN SESENA DEBEN, Pediat. españ. **21**:137 (March) 1932.

The author concludes that the person with adenoids is definitely susceptible to tuberculosis on account of his lowered resistance. She believes that vitamins as well as the administration of calcium chloride cause only a transitory elevation of calcium in the blood. The calcium in the blood of the person with adenoids is lower than normal. According to her observation, removal of the adenoids will cause elevation of the blood calcium.

SCHLUTZ, Chicago.

LARYNGOSTENOSIS AND GLYCOSURIA IN A CHILD. MARTIN STRÜMPEL, Deutsche med. Wchnschr. **58**:1722 (Oct. 28) 1932.

In 1900 Leichtenstern called attention to the fact that in diabetes the vocal cords may get dry, and that if this condition persists for a while inflammatory processes in the mucous membrane of the larynx may follow.

The author describes the case of a boy, 8 years of age, who was never ill before and in whom, in the course of six hours, such dyspnea and laryngospasm suddenly developed that tracheotomy was indicated. Laryngoscopic examination revealed that the epiglottis and trachea were swollen and red. In the course of the complete examination, 1.6 per cent sugar was also found in the urine of the child. Tests for acetone and diacetic acid were positive. After tracheotomy, proper diet and insulin, the child made an uneventful recovery and went home, having a regular diet without insulin. When the child was seen again, five months later, he was in good health, without any evidence of diabetes mellitus. Therefore, the conclusion of the author is that the laryngostenosis of this child was not the complication of a true diabetes mellitus but the result of a general infection, which also damaged the pancreas or kidney and caused a secondary glycosuria. Both the laryngostenosis and the glycosuria were transient and ceased after the infection stopped.

KERESZTURI, New York.

DO PATHOGENIC MICRO-ORGANISMS GET INTO THE CIRCULATION DURING TONSILLECTOMY. E. WIRTH, Deutsche med. Wchnschr. **58**:1755 (Nov. 4) 1932.

It is well known that sometimes after tonsillectomy there are recurrences of previously existing systemic diseases, such as polyarthritis, nephritis or endocarditis. The explanation of this observation by some writers is that pathogenic organisms and toxins might enter the circulation in connection with the removal of the tonsils. This contamination of the blood stream occurs more often if the tonsils are acutely inflamed before removal.

The author made five cultures of blood for each of forty-five patients before and after removing their tonsils. Fifteen did not have acute inflammation of the tonsils at the time of operation. Five patients had recovered from an acute attack, from one to three weeks prior to the operation. In twenty cases, besides recurrent sore throat, general systemic disease was also present.

In all of the forty-five patients the five cultures of the blood were negative.

KERESZTURI, New York.

TREATMENT OF MASTOIDITIS. HERMANN ZISCHINSKY, Jahrb. f. Kinderh. **136**: 310 (Sept.) 1932.

Forecful presentation of the argument for conservative treatment of mastoiditis is given; it is based on the observation of 181 cases occurring among 76,000 cases of infectious disease at Popischill's clinic. At the first local sign of mastoiditis, a leech is applied, and often cure is obtained. If not, heat is used until a subperiosteal abscess fully matures. Under local anesthesia, this abscess is incised and drained. Antrotomy is never done unless cerebral complications or sinus thrombosis develops, or unless the conservative method fails. The ultimate results appear to be good.

CLAUSEN, Rochester, N. Y.

TONSILLECTOMY DURING ACUTE TONSILLITIS. E. WORTH, München. med. Wchnschr. **79**:1673 (Oct. 14) 1932.

The dangers and technical difficulties of tonsillectomy during the stage of acute inflammation are overemphasized. The operation should be performed with the patient under local infiltration anesthesia (procaine hydrochloride and epinephrine). The indications for tonsillectomy in the presence of an existing tonsillitis are the occurrence of complications such as peritonsillar abscess or postanginal sepsis. The result following tonsillectomy is often striking, especially in patients with sepsis.

BRAHDY, Mount Vernon, N. Y.

THE CONSERVATIVE TREATMENT OF TONSILLITIS BY THE SUCTION METHOD OF ROEDER. M. JÄGERMANN, München. med. Wchnschr. **79**:1751 (Oct. 28) 1932.

Tonsils should not be removed as frequently as they are at present because they have a protective function and, moreover, the tendency for the development of colds continues after tonsillectomy. A simple conservative method for the treatment of acute and chronic tonsillitis is by the suction technic of Roeder. A glass suction cup at the end of a glass tube fits over the tonsil. The end of the glass tube is attached to a rubber bulb. By proper manipulation infected material can be sucked out of the tonsillar crypts. The frequency of the treatment depends on the type and duration of the disease and the condition of the tonsils. Usually, suction is performed two or three times a week for several weeks.

BRAHDY, Mount Vernon, N. Y.

THE ROENTGEN TREATMENT OF TONSILS IN CHILDREN. H. ZOEPFFEL, München. med. Wchnschr. **79**:1753 (Oct. 28) 1932.

Zoepffel reports his results with roentgen treatment of fifty children with hypertrophied tonsils. Good results were obtained in 68 per cent of the thirty-eight children with large, soft tonsils and in 25 per cent of the twelve children with firm, fibrotic tonsils. A result was considered good if the tonsils became smaller and there was an improvement in the subjective symptoms, such an anorexia, impairment of hearing, difficulty in breathing, a tendency toward tonsillitis and pains in the joints. The treatments were repeated two or three times at intervals of five or six weeks. A few children with fibrotic tonsils were given five exposures. No ill effects were observed. There was no excessive bleeding among those who subsequently required adenoidectomy.

BRAHDY, Mount Vernon, N. Y.

ROENTGEN TREATMENT FOR DISEASES OF THE TONSILS. G. SCHULTE, Strahlentherapie **36**:708, 1930.

The author has been irradiating tonsils since 1924. He tried to find the smallest effective dose in order to avoid injuring the many lymph glands of the region which are particularly sensitive to irradiation. The patient lies on his back with his head turned to one side. The tube is placed at the angle of the jaw and the rays are directed upward and backward so as to strike the pharyngeal as well as the palatal tonsil. The focus skin distance is 30 cm., the field being 6 by 8 cm.; children are given 140 kilovolts, filtered through 4 mm. of aluminum (⅓ skin erythema dose [147 roentgens]); adults, 210 kilovolts, filtered through 1 mm. copper and 1 mm. aluminum (⅓ skin erythema dose [170 roentgens]). The second irradiation from the other side is given in the same way the next day or the day after in order to avoid too intense reactive swelling. Homogeneous irradiation of the whole pharyngeal ring is not used. The same cycle of irradiation is repeated after four weeks and again in eight weeks if necessary. In the course of six years the author has irradiated 257 patients, 132 children and 125 adults; 90 per cent of these were cured, 6 per cent were improved and 4 per cent were not improved. Large, hard fibrous tonsils did not contract much; the author now generally operates on such patients. Softer hypertrophied tonsils return to their normal size. The treatment is particularly effective in chronic recurrent anginas. Several patients who had chronic recurrent polyarthritis, the attacks generally following attacks of angina, were relieved. Roentgen treatment has an advantage over tonsillectomy in that it does not require anesthesia and there is no shock, loss of work, danger of primary or secondary hemorrhage, possibility of infection or pulmonary complications or aural infections. It is often impossible to perform operation, while roentgen treatment is always possible.

MORGAN [AM. J. ROENTGENOL.]

OTOGENOUS THROMBOSIS OF CAVERNOUS SINUS WITH RECOVERY FOLLOWING ORBITAL PERFORATION. B. LARSEN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **30**:663 (July 22) 1932.

Larsen reports the case of a boy, aged 3, in whom thrombosis of the cavernous sinus developed in connection with acute otitis media and mastoiditis. The symptoms were typical: chills, remittent fever, edema of the eyelids, exophthalmos, ophthalmoscopic changes and so on. About seven weeks after hospitalization, spontaneous perforation of the bilteral orbital abscesses resulted in immediate improvement and rapid recovery. The author found only two other cases in the literature in which the healing of a thrombosis of the cavernous sinus resulted from the spread of suppuration into the orbit and final spontaneous perforation of the orbital abscesses.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

Diseases of the Skin

STUDIES ON RINGWORM FUNGUSES WITH REFERENCE TO PUBLIC HEALTH PROBLEMS. LEE BONAR and ALICE DREYER, Am. J. Pub. Health **22**:909 (Sept.) 1932.

Studies were carried out to determine whether the ringworm fungus is capable of growing on materials commonly found on the floors of showers and dressing-rooms. Such material was collected, sterilized, and inoculated with Trichophyton interdigitale and kept at room temperature. The fungus grew rapidly on such material as hair, wool, silk, horn and feathers and on algal growth collected from damp floors. On such material the fungus remained viable after long periods of drying.

An effort was made to discover a floor disinfectant that was nonirritant to the skin of the feet. A 1 per cent solution of sodium hypochlorite requires one hour or longer to kill the fungus borne in scales of the skin. The thermal death point of cultures grown in fabrics showed complete killing in ten minutes at 75° C. Standard power laundry practice in general destroys the fungus. Standard dry cleaning solvents, however, have a negligible killing action after exposure of from one to two hours.

PARKER, Rochester, N. Y.

REMOTE PROGNOSIS OF ERYTHEMA NODOSUM. E. LESNE, V. BOUGUIEN and P. GUILLIAN, Arch. de méd. d. enf. **36**:21 (Jan.) 1933.

Between the years 1920 and 1932, these clinicians have had thirty-nine patients with erythema nodosum under observation at the Trousseau Hospital. Practically all of these children have been followed for the entire period of their illness; each patient has had an intensive investigation of his antecedents, with the view of determining the extent of exposure to tuberculosis; each one has had a series of stereoscopic roentgenograms, preserved for comparative study, and the entire group has been subjected to the various tests of the skin with tuberculin.

In seventeen of the children, or 43 per cent, there was a definite history of family infection, a much higher proportion than that reported recently by Gueissaz, who found the patients in only 8 per cent of his series of two hundred cases to have been directly exposed to open tuberculosis. The writers feel that their unusual returns may be due to the stratum from which their patients were drawn, representing as it did the poorest elements in the city, and also to the fact that these children were selected by experienced social-medical workers.

Roentgen studies revealed calcareous lesions in every case of erythema nodosum, conforming in all respects with the familiar picture of hilar involvement in the primary infection of infancy. Likewise, all patients gave a positive reaction to tuberculin, many of them to the point of vesiculation. These facts seem to justify the contention that the disease is essentially a manifestation of tuberculosis, with a terrain favorable to the development of any one of its well known lesions.

An extremely interesting report is made on the subsequent fortunes of these children; twenty-two among the thirty-nine who have thus far been completely

checked are well, although during these twelve years several have sustained serious extension of their infection, such as serofibrinous pleurisy or tuberculous pneumonia. There were no instances of tuberculous meningitis or miliary tuberculosis, and so far as is known, there have been no fatalities in the entire series.

The authors feel that they can declare that the ultimate fortunes of children with the eruption will be good, but do not deny that, in their own cases, the particular care the children enjoyed undoubtedly influenced the mortality rate. Separation from the family and removal to salubrious marine or mountain resorts with meticulous attention to rest and diet are credited in full measure for the results.

AMESSE, Denver.

NERVOUS DISTURBANCES IN "EPIDEMIC MILIARIFORM EXANTHEM OR MILIARY SWEATING" IN CHILDREN. A. STROE, P. THEODORINI and S. CHISER, Bull. Soc. de pédiat. de Paris **30**:427 (April 2) 1932.

The authors report a series of cases of the disease, which occurs in epidemics, and refer to three previous publications by them concerning it. The cardinal features are profuse sweating, fever and a miliariform exanthem which is followed by a branny desquamation of the entire skin except that of the palms and soles. It occurs chiefly in children less than 2 years old, occasionally in children from 2 to 10 years old and rarely in older persons. They observed it in two nursemaids of 17 and 19 years, respectively. The blood picture shows lymphocytosis, with a count of from 60 to 80 per cent, and an increase in the number of eosinophils. They describe the form of the disease which is accompanied by nervous and mental symptoms and list the latter under three headings: (1) increased intracranial pressure, which is the most common, (2) meningeal involvement, which is rare, and (3) encephalitis, which may have sequelae. They believe that the infectious etiologic factor in this disease, presumably a virus, has distinct cutaneous and neurotropic affinities and therefore produces disturbances of the skin and of the nervous system. They mention that encephalitis has been produced in the rabbit by inoculation into the cornea of material obtained from some of the vesicles in this disease.

BENJAMIN, Montreal, Canada.

ERYTHRODERMIA CONGENITA ICHTHYOSIFORME. BEJARANO, Med. latina **6**:26 (Jan.) 1933.

The patient was presented at the November, 1932, meeting of the Spanish Society of Dermatology and Syphilography. She was a girl of 9 years in whom both the erythrodermic and the ichthyotic elements were well marked. She presented the typical characteristics of ichthyosis with the peculiarity of an intense palmoplantar keratodermatosis and less pronounced lesions in the flexures. Riecke classifies congenital ichthyosis as of three forms: (1) ordinary congenital ichthyosis or diffuse malignant keratoma, which is rapidly fatal; (2) larval congenital ichthyosis, resembling the first form, and (3) delayed congenital ichthyosis, which appears a longer or shorter period after birth. The latter group is the one most closely resembling common ichthyosis. According to Siemens, it is only this form that appears in the flexures. Congenital ichthyosiform erythrodermia may be of either the second or the third form. There is some difficulty in distinguishing the congenital from the common form. In ichthyosis, the congenitohereditary element is clear, but to what extent is this factor seen in common ichthyosis? Beyond question, in the hereditary transmission of common ichthyosis the dominant characteristic predominates, and in the congenital form the recessive characteristic. Histologic study of the author's case showed hyperkeratosis, most accentuated in biopsy of the palm, and alterations of the sebaceous glands.

VINTON, Brooklyn.

Surgery and Orthopedics

APPENDICITIS UNDER TWO YEARS. R. L. KEMPTON, J. Michigan M. Soc. **31**: 188 (March) 1932.

A case of appendicitis, with the autopsy observations, in an infant of 18 months is reported. A summary of opinions as to the frequency of appendicitis in the infant group is given. The author reasons that the low incidence of the condition at this age is due to the smaller amount of lymphoid tissue present, the avirulence of Bacillus coli at this age and the larger size of the appendix, facilitating better drainage. The thinness of the appendical wall and the inadequacy of the omentum and of other means for walling off the process make the prognosis poor. In general, diagnosis rests on the same symptoms as those in older persons, though there is more difficulty in their recognition. Vomiting, with palpable resistance in the abdomen, occurs in most instances.

SMITH, Ann Arbor, Mich.

INJURIES ABOUT THE ELBOW IN CHILDREN. ROBERT JONES, Brit. M. J. **1**:739 (April 23) 1932.

The author comments on the frequent unsatisfactory results in treating injuries about the elbow, especially in children. He discusses the centers of ossification, the normal movement of the elbow joint, the frequency and site of dislocation and, finally, fractures of various parts of the bone entering into the formation of the elbow joint. He describes methods of reducing fracture in various bones, outlines the treatment and describes the serious complications.

ROYSTER, University, Va.

SURGICAL DISORDERS OF THE URINARY TRACT IN CHILDREN. H. P. WINSBURY-WHITE, Lancet **2**:1317 (Dec. 17) 1932.

Gratifying results are obtained in congenital narrowing of the external urinary meatus after meatotomy and urethral dilatation. It should be borne in mind that chronic infection with coliform bacilli by no means excludes tuberculosis.

In turn, the diagnosis and treatment of perinephric abscess, the different varieties of urinary calculi and new growths are considered. For the correction of hypospadias the author recommends a modified Bucknall operation. The histories of twenty cases that came under the author's personal observation and which illustrate the various conditions mentioned are appended.

LANGMANN, New York.

HARELIP: OPERATIONS FOR THE CORRECTION OF SECONDARY DEFORMITIES. HAROLD GILLIES and T. POMFRET KILNER, Lancet **2**:1369 (Dec. 24) 1932.

In this article the authors discuss in detail the various procedures that may be employed to free the patient entirely from any vestige of harelip stigma, for, as they state, "the original deformities of the nose and lip are often so complex that it is unreasonable to expect any one primary operation, undertaken as it usually is at a very early age, to accomplish more than an aseptic closure with simple adjustment."

LANGMANN, New York.

SLIPPING OF THE EPIPHYSIS OF THE HEAD OF THE FEMUR: ITS RELATION TO RENAL RICKETS. JAMES F. BRAILSFORD, Lancet **1**:16 (Jan. 7) 1933.

The author claims that renal rickets is the cause of disorganization of the metaphysis. Slipping of the epiphysis of the head of the femur in adolescents is due to this disorganization of the metaphyseal tissue which destroys its capacity to withstand the static strains or the trauma to which the normal joint is subjected without harm.

LANGMANN, New York.

ENDOTHELIOMA OF THE BONE OR EWING'S SARCOMA. ROBERT SOEUR, Rev. d'orthop. **19**:197 (May) 1932.

Soeur suggests the following synonyms for the condition he describes: (diffuse) endothelial myeloma, perithelioma, reticulosarcoma, globoid cellular sarcoma, Ewing's tumor and endothelioma of the bone. It forms approximately 11 per cent of the tumors of the bone.

When the tumor is nontraumatic, the following symptoms are found: an insidious onset, deep-seated pain, a poorly defined border, edema, redness, local swelling and a slightly elevated temperature; it simulates subacute osteomyelitis or chronic embolism.

Roentgenograms are usually negative at the onset and for the first week or two. In the diagnosis, the following points should be considered: Bacillary invasion, such as tuberculosis, produces articular symptoms. The sarcoma is juxta-articular. In Ewing's tumor, the symptomatology is usually diaphyseal. After a lapse of several weeks, the roentgenogram shows definite tumor formation, with rarefaction. At operation, soft vascular granulations are found, but no evidence of infection such as with staphylococci or streptococci. Metastases are insidious, in contradistinction to osteomyelitic metastases. The metastases have a predilection for the base of the skull, the ribs, the tip of the spine and then the lungs and other organs. The metastases of osteogenic sarcoma have a predilection for the lungs, ganglions and such organs.

The macroscopic findings are as follows: There is a diffuse, soft, vascular, opaque, cellular tissue eroding the cortex of the bone and perforating it. Osteogenic sarcomas, on the other hand, are localized and encapsulated and form a definite tumor mass.

In the differential diagnosis one must consider: (*a*) giant cell tumor, benign, with much swelling; (*b*) myelomas, which usually occur in the aged, several bones being involved; roentgen evidence is seen early; Bence-Jones bodies are present; (*c*) tuberculosis; decalcification occurs throughout the whole length of the bone; (*d*) periarticular tuberculosis, i. e., Brodie's abscess; (*e*) gonococcal arthritis; (*f*) arthritis of other origin, and (*g*) syphilis.

Simple curettage is fatal in cases of Ewing's tumor. Surgical intervention must be complete. The tumors are radiosensitive; therefore, early use of the roentgen rays both for treatment and as a radiotherapeutic test is advised. This treatment should be given in all cases of tumors of the bone, since the patients are not harmed, and Ewing's tumor may be stopped. Radium is useful, but deep roentgen therapy is satisfactory. Coley's toxin may eventually prove of benefit. Recurrences are frequent; therefore, roentgen treatment should be given early and often. Amputation is still the operation of choice when deep roentgen therapy has not been used early, and even then amputation is the best preventive of metastases.

The prognosis depends on the treatment. RYAN, Vancouver, B. C.

EXTIRPATION OF A LARGE DUMBBELL-SHAPED LIPOMA OF THE THORAX IN A FIFTEEN MONTH OLD CHILD. P. WALZEL, Arch. f. klin. Chir. **170**:111 (May) 1932.

An otherwise normal 15 month old infant showed a beginning tumor in the right axilla, which grew rapidly and filled almost the entire axillary space within five months, extending downward to the fifth intercostal space. Roentgen examination showed it to extend into the thoracic cavity also.

Operation revealed a dumbbell-shaped tumor, one portion of which was extrathoracic and weighed 160 Gm.; the other was intrathoracic and weighed 240 Gm. The two portions were connected by an isthmus of tissue. The intrathoracic portion was so large as to compress the right lung almost completely. On cut section the outer portion was yellowish white, the inner a light yellow. Both were found on

microscopic examination to be fibrolipomas. The child had an uneventful recovery. This case is unusual, and only a few instances of this condition are reported in the literature.

KOHN, Milwaukee.

SURGICAL REMOVAL OF A CYSTIC KIDNEY IN AN INFANT, WITH A DISCUSSION OF CONGENITAL HYDRONEPHROSIS. H. SCHNEIDER, Deutsche Ztschr. f. Chir. **237**:115 (Aug. 17) 1932.

The author stated that unilateral cystic kidney or congenital hydronephrosis is seldom successfully operated on in infants. He reported the case of a female infant with a bilateral cleft lip who was operated on for this condition at the age of 14 days. There was at that time no evidence of any other congenital anomaly. At the age of 3 months, the child was returned to the clinic because she did not thrive and vomited often. There was a definite swelling in the abdomen which, according to the mother, had been steadily increasing in size. This mass was palpable, appearing as a tumor-like swelling in the left lower region of the abdomen. The urine was normal. Intravenous injection of skiodan followed by roentgenograms disclosed the outline for the right kidney. The left kidney could not be recognized. Its site was occupied by a large mass of uniform density with a regular outline which extended from the pelvis to beneath the lower ribs. Cystostomy was performed under anesthesia. The bladder was found displaced toward the right side. The right ureteral orifice appeared normal. The left was round and appeared contracted, and a probe could not be passed beyond the orifice. After intramuscular injection, indigocarmine appeared at the right ureteral orifice in ten minutes; none appeared at the left within twenty-five minutes. The child was operated on, and a large cystic left kidney was removed. The position of the ureter was occupied by a fibrous cord without a demonstrable lumen. The postoperative course was uneventful, and five weeks later the child underwent a second operation on the upper jaw. The vomiting and poor state of nutrition of the child previous to nephrectomy were attributed to pressure by the cystic kidney on the other abdominal organs.

The author emphasized the importance of intravenous pyelography in infants and children but stated that its use should supplement, and not be substituted for, cystoscopic studies. The function of both kidneys should be carefully observed before nephrectomy. In infants the author recommended methyl propyl carbinol methane in doses of 0.2 Gm. per kilogram of body weight by rectum as an anesthetic.

As a result of histologic study of the specimen removed at operation, the author concluded that this was a case of hydronephrosis which had started in utero as a result of failure of union of the ureteral process with the metanephron.

The association of congenital hydronephrosis and cleft lip is interesting. The author reported six cases of this condition, and described a case he had seen in an adult in which a cleft lip was associated with sarcomatous degeneration of a left undescended testicle and complete aplasia of the left kidney.

GLASER, Rochester, N. Y.

SYMPTOMS AND TREATMENT OF EMPYEMA IN CHILDHOOD. HERMANN ZISCHINSKY, Jahrb. f. Kinderh. **137**:125 (Nov.) 1932.

The author urges expectant treatment in empyema complicating the infectious diseases. Operative treatment was carried out usually as a last resort. Of 84 patients, under 1 year of age, 3 recovered; of 90 patients between 1 and 2 years, 11 recovered, and of 102 over 2 years, 37 recovered. It is pointed out that these cases cannot be compared with those in which the patient is free from contagious disease

CLAUSEN, Rochester, N. Y.

Society Transactions

CHICAGO PEDIATRIC SOCIETY

Regular Meeting, March 21, 1933

ARCHIBALD HOYNE, M.D., *President in the Chair*

THE MORO REFLEX IN THE NEW-BORN. DR. HEYWORTH N. SANFORD.

This article was published in full in the August issue, p. 337, of the AMERICAN JOURNAL OF DISEASES OF CHILDREN.

DISCUSSION

DR. JOHANNA HEUMANN: Did any of the 1,576 infants have cerebral irritation?

DR. E. T. MCENERY: I should like to ask Dr. Sanford what he thinks about employing a loud noise for the purpose of eliciting this reflex, if a proper table is not available.

During the past two years, since Dr. Sanford first reported his work at the Presbyterian Hospital, we have observed more than 2,500 babies in the first few days of life. Eleven with a fractured clavicle gave a positive Moro reaction, and 6 failed to give one. I have felt that a loud noise is perhaps as effective as the slapping of the table; it is less painful for the examiner.

DR. CLIFFORD G. GRULEE: I think that this work is important from another standpoint, and that is the differentiation between edema and hemorrhage. We have all been ready to believe that these symptoms are caused by hemorrhage alone, whereas the cause in most instances is probably edema.

I wish to stress the fact that I think that Dr. Sanford is right in his designation of a proper table on which to examine the child. One cannot elicit the Moro reflex in many instances without it.

DR. HEYWORTH N. SANFORD: None of the 1,576 infants had cerebral involvement.

The table is important in many ways. It might be said that if one does not obtain a Moro reflex it is because one does not have the proper table. That is not true, but the table must be such that when it is struck the position of the child is changed. If it is impossible to obtain such a table, the Moro reflex can be secured if the child is held horizontally in the hands and the head is allowed to drop several inches. Obviously, this is not the method of choice.

Noise involves the centers that are stimulated. It is known that Peiper and Isbert did not think that the reflex elicited is medullary. They thought that the semicircular canals are involved. If this is true, the position of the body is the stimulus that evokes the reflex. I am not prepared to say anything about this, for we have not completed our histologic studies of this matter.

IMMUNITY PRODUCED BY DIPHTHERIA TOXOID. DR. JOSEPH GREENGARD.

This article will be published in full in a later issue of the AMERICAN JOURNAL OF DISEASES OF CHILDREN.

THE DIAGNOSIS OF CONGENITAL SYPHILIS. DR. A. H. PARMELEE and DR. L. J. HALPERN.

This paper is a report of the results obtain from a study of 104 infants born of mothers known to be syphilitic. All were born at the Cook County Hospital

between the autumn of 1928 and the autumn of 1930. The purpose of the study was to determine how early a diagnosis of congenital syphilis could be made and the relative importance of the various aids to diagnosis.

A physical examination was made during the first days of life, blood was drawn for Wassermann and Kahn reactions, and roentgenograms were made of the long bones. This procedure was repeated at 6 weeks, 3 months, 6 months and 1 year of age.

A comparison of the results obtained revealed strikingly the preeminent importance of roentgenographic evidence of osseous lesions in the diagnosis of congenital syphilis. During the new-born period there was suggestive clinical evidence of infection in 19.75 per cent of the cases, serologic evidence in 22.2 per cent and roentgenologic evidence in 43 per cent. At 6 weeks of age there were clinical evidence in 30 per cent, serologic evidence in 8 per cent and roentgenologic evidence in 61 per cent; at 3 months, the figures were 25 per cent, 8 per cent and 68 per cent, respectively.

Our study shows that a probable diagnosis of congenital syphilis can be made during the first three months of life in from 60 to 70 per cent of infants born of syphilitic mothers. In only 30 per cent, however, can a positive diagnosis be made. By the sixth month a probable diagnosis can be made in 55 per cent, but in only 15 per cent can a positive diagnosis be made.

In 83.7 per cent of the infants studied either definite or suggestive evidence of infection was found some time during the first year. We considered that a positive diagnosis could be made in 67 cases, or 64.4 per cent of our series. In 95 per cent of the 67 cases a diagnosis could be made through evidence of osseous lesions as revealed by roentgenograms. Only 29 per cent of the 67 patients gave positive reactions to the serologic tests.

Osteochondritis is the earliest lesion produced in congenital syphilis. Periostitis is rarely seen during the new-born period. It becomes moderately frequent in the sixth week, and by the third month is present in more than half the patients showing osteochondritis. It is extremely rare for periostitis to occur as the only change in the bones of syphilitic infants.

The purpose of this report is to call attention once more to the great diagnostic significance of osseous lesions in congenital syphilis as revealed by roentgenograms.

DISCUSSION

DR. CHARLES SCHOTT: It is important to know whether or not the mother was receiving treatment before the child was born. It is still more important to know which of the mother's children the patient is and when the mother contracted syphilis. In his book published in about 1900, Hochsinger discusses this question thoroughly. About ten years ago there was an article in the *Bulletin of the Johns Hopkins Hospital* describing how Hochsinger and his associates made roentgenograms of fetuses and showed definitely the findings of syphilis. The absence of serologic or clinical findings at an early age is not new. The absence of positive findings is dependent entirely on which child the patient is.

DR. ARTHUR H. PARMELEE: As this work was carried on jointly by Dr. Halpern and me, I wish to make a few explanatory remarks.

Dr. Schott's criticism is much to the point. We realize that this work is entirely incomplete. As we stated, we are trying to show that in the cases we studied, the roentgenologic findings were apparently much more significant than the clinical or the serologic findings. When I started to study new-born infants at the Cook County Hospital I was struck by the absence of clinical findings of syphilis. This is not a new observation, but we wondered how soon other findings would occur and what the important thing to look for was. The serologic evidence was unreliable. In the new-born period only 13 patients gave positive reactions to the serologic test. Most of the material was from cases in Negroes, and for that reason the history obtained from the mother was unreliable. We have further work under way in which we hope to study many other findings. We have records

of the mothers' previous pregnancies and similar information, but I did not think that it was wise to include these in this report. In three or four instances in which the serologic reaction was positive in the new-born period, it became negative in the second period. This also is not a new observation. Others have remarked that perhaps the positive Wassermann and Kahn reactions in the new-born period is a carry-over from the mother and is not due to syphilis in the child.

This report shows that it is important for all physicians who deal with children, especially pediatricians, to be conversant enough with the roentgen appearance of the osseous lesions in congenital syphilis at least to suspect whether or not the child has this condition.

I wish to say that this work consumed a great deal of time. We started it in 1928 and have been working on it ever since. The roentgenograms have been examined many times and have been culled out here and there until we think that we have finally obtained a fairly accurate series.

DR. H. E. IRISH: No mention was made as to whether or not the infants were treated during the first year. A consideration of this point might have a bearing on the serum reactions in the later period of the observation.

DR. F. W. SCHLUTZ: I think that roentgenography is one of the most valuable measures we have of recognizing syphilis in obscure cases, particularly in those in which the mother has received rather intensive treatment during pregnancy and the offspring is apparently free from syphilis but manifests a suggestive sign of disease in the osseous structure. I think that this diagnostic measure has not been sufficiently recognized in this country. Perhaps we see fewer cases here than are seen in other countries. Those which we see are difficult to diagnose, and we have learned to rely largely on the osseous appearance for the diagnosis of syphilis in the early stages. I think that the paper is timely and valuable.

DR. PHILIP L. ARIES: Dr. Borovsky and I have been observing the new-born infants of syphilitic mothers at the Cook County Hospital. Most of the mothers receive antisyphilitic treatment during pregnancy. During the past nine months we have found only a single infant for whose condition a diagnosis of syphilis could be made clinically without recourse to the history, serologic tests or roentgenographic examinations of the bones. This baby lived only one day. I should like to ask Dr. Halpern what criteria he used in making a clinical diagnosis of syphilis in the new-born.

DR. L. J. HALPERN: As to Dr. Irish's question about the effect of treatment on the infants, I wish to emphasize that our problem was to determine at what period in infancy a positive diagnosis of infection could be established by a roentgenologic, serologic or clinical method of examination. Once a diagnosis of syphilis was made, the infant was referred to the social service department for treatment and was dropped from further consideration in this study.

As to what constituted suggestive signs of congenital syphilis in the infants, I repeat that rhinitis, enlargement of the spleen and similar findings previously mentioned were tabulated as clinically suggestive of infection, particularly in view of the fact that the infants were born of mothers known to be infected. However, further study with roentgenologic and serologic methods was necessary to confirm or refute the suggestive clinical findings.

WHOOPING COUGH. DR. M. L. BLATT and DR. I. M. LEVIN and (by invitation) DR. MAURICE DALE, DR. DAVID MANSOWITZ and HELEN KESSLER.

Epidemics of whooping cough at the Cook County Hospital, St. Vincent's Infant and Maternity Hospital and the Illinois Eye and Ear Infirmary and thirty-five cases from private practice form the basis of this study.

The disease was traced from ward to ward in the various institutions. Thirty-five patients were given prophylactic subcutaneous injections of mixed pertussis vaccine. Only fourteen of these patients, however, were definitely proved to be susceptible to the disease. Of this group, eleven did not contract pertussis. In another ward at the Cook County Hospital, ten of fourteen susceptible children

were apparently fully protected by the use of an antivirus intranasally. This serum was furnished through the courtesy of the G. H. Sherman Laboratories.

At the Illinois Eye and Ear Infirmary, where there were four susceptible patients, three were given ten daily intracutaneous injections of pertussis vaccine, beginning with a dose of 0.1 cc. which was gradually increased to 0.55 cc. Whooping cough did not develop in these three patients, although they were constantly exposed to one child who had whooping cough. Another child in the same institution was apparently immunized by five subcutaneous doses, beginning with a dose of 0.3 cc. and ending with one of 1 cc., given at four day intervals.

Fourteen infants at St. Vincent's Infant and Maternity Hospital were treated prophylactically with nasal instillations of a gel the basis of which was a lysate of the Bordet-Gengou organism, furnished by Eli Lilly and Company. Thirteen of these susceptible infants were apparently completely protected. Ten of the group were treated by nasal instillation of the same preparation in liquid form. Eight were protected. The three infants in these two groups who contracted the disease never whooped, but positive cultures were obtained from their cough plates.

From sixty-nine clinically diagnosed cases of whooping cough, thirty-three positive cough plates were obtained. From four of fourteen cultures from the nose, positive results were obtained. The Bordet-Gengou organism was present in thirty-eight of seventy-nine cultures from the throat. In fifty-nine instances, cultures of one type or another were made, and in forty-five (76 per cent) of these, positive results were obtained. Positive cultures were obtained as early as five days and as late as seventy days after the onset of the cough.

In addition, positive cultures were obtained from three children who had never had the disease and in whom it did not develop and from three other subjects who had a history of whooping cough several years before and none of whom contracted the disease the second time.

The blood counts showed a decrease in lymphocytes fifteen days before the onset of the paroxysms, an increase to a peak at the beginning of the paroxysms and a decrease to approximately normal sixty days after the paroxysms. The rise in the percentage of lymphocytes was much more marked than was that in the total white cell count.

Seventeen patients with whooping cough were treated by instillation of the lysate gel intranasally. Four of the cases were classified as severe, but in three of them the treatment was not begun until the fourteenth day. The other cases were mild. Through the courtesy of Lederle's laboratories, a formaldehydized vaccine was used as a treatment for active pertussis. In seven of eight cases, the results were satisfactory, the disease being mild and without complications.

Human blood was injected intramuscularly into eleven susceptible children ranging in age from 4 weeks to 1 year. These injections were given as soon as possible after contact with the disease; the result was apparent complete protection in eight cases and mild whooping cough in three.

DISCUSSION

DR. MAURICE DALE: I might add a few words regarding the findings in the blood. In a few of the cases, as Dr. Blatt mentioned, the patient showed definite leukopenia at the onset of the cough or just before the cough began, but the number of leukocytes was not sufficient to warrant one to say whether or not this was a definite finding.

We believe that the rise in the lymphocyte count is of more important diagnostic value than the total white cell count. In one case there was no increase in the leukocytes but a pronounced increase in the lymphocytes. From a single count it was almost impossible to diagnose pertussis early in the disease. However, in the cases in which a count was made before the onset of the cough, subsequent counts showed an increase of the lymphocytes sufficient for a diagnosis.

HELEN KESSLER: The cultural method used was that which Madsen employed at the Danish Institute of Serology (slightly modified). At the end of the second day pinpoint colonies were noted, and were studied carefully each day thereafter. At the end of four days the colonies were confirmed by microscopic examination.

NORTHWESTERN PEDIATRIC SOCIETY

ALEXANDER STEWART, M.D., *Secretary*

March 22, 1933

IRVINE MCQUARRIE, M.D., *Presiding*

CONGENITAL CHYLOUS ASCITES. DR. H. E. HILLEBOE and DR. MILRDED R. ZIEGLER.

Since Morton first described chylous ascites in 1691, there have been numerous cases reported, but less than ten of these have been of the congenital type. The case which we observed belongs in the latter group and is of special interest because of the opportunity afforded for extensive study, including clinical, chemical, bacteriologic and postmortem examination.

The patient was a white male infant, born at full term on Sept. 27, 1932. The baby appeared to be normal at birth except for enlargement of the abdomen and scrotum. On the second day of life the scrotum was aspirated by the family physician, who is said to have obtained about 1 ounce (31.1 Gm.) of clear, straw-colored fluid, following which the size of the scrotum remained diminished for a number of weeks. The infant was artificially fed on whole milk diluted with water and Karo syrup. By Jan. 1, 1933, marked distention of the abdomen and scrotum had developed. No vomiting, colic or constipation had been noted. Castor oil was administered at that time, and this relieved the distention within from three to four days. By February 6, the abdomen and scrotum had again become very much distended and had continued to increase in size in spite of repeated doses of castor oil. No other symptoms were present.

The patient was admitted to the University Hospital in Minneapolis, on February 11, for relief of acute distention of the abdomen. Examination revealed an infant with some dyspnea, which was apparently caused by an enlarged abdomen containing fluid. The scrotum was very large and tense and contained fluid. No masses were felt in the abdomen or in the rectum. The remainder of the examination gave essentially negative findings. The state of nutrition of the body was good. The Wassermann and Mantoux tests were negative. It was thought that the ascites was due to some obstruction in the thoracic duct, because no other pathologic factor could be demonstrated.

Aspiration of the abdomen performed for the purpose of making a diagnosis showed a milky, serous, odorless fluid to be present, 1,250 cc. of which was removed. The material was sterile. It had a specific gravity of 1.010, was alkaline in reaction and showed droplets of fat when viewed under the microscope. Chemical analysis of the first sample obtained showed the following values: total proteins, 3.8 per cent; total lipids, 2.5 per cent, and cholesterol, 116, lecithin, 496 and dextrose, 110 mg. per hundred cubic centimeters.

Different diets varying in fat content were used to determine the effect on the character and amount of ascitic fluid formed. A direct relationship was found between the type of diet and the fat content of the ascitic fluid, the total lipids falling to as low as 0.52 per cent on a regimen of skimmed milk. With a normal diet the values for cholesterol and sugar were similar to those of the blood; the protein content was low, while the values for lecithin and total fat were higher than those of the blood.

Because of the claim of some observers that chylous fluid is bactericidal, an attempt was made to determine whether this is so. A variety of common organisms, such as the pneumococcus, streptococcus and organisms of the typhoid-colon group, were cultured in varying dilutions of each of the samples of chylous fluid. No bactericidal power could be demonstrated. The bacteriostatic properties were also tested by the standard methods, but proved to be ineffective in preventing the growth of organisms. However, this chylous exudate does not putrefy on standing at room temperature for ten days in an open vessel.

On March 11, bilateral otitis media and diarrhea developed. In spite of treatment, the patient died on March 15.

Postmortem examination revealed nothing abnormal, except bilateral otitis media, until the thoracic duct was examined and dissected. The mesentery showed no tumors or cysts and no rupture of the lacteals. In the upper third of the thoracic duct there was a distinct narrowing, and fluid introduced into the duct by a syringe and needle could not be forced through this portion from either above or below. Apparently there was atresia of the thoracic duct, which resulted in back-pressure of the chyle sufficient to cause its escape into the peritoneal cavity.

DISCUSSION

DR. OWEN H. WANGENSTEEN: This is a most interesting anomaly. I was unaware that such interruptions of the thoracic duct occurred. It is also somewhat surprising that suspension of continuity of the thoracic duct should lead to the development of chylous ascites, for in most instances this duct establishes communications with the azygos, hemiazygos or intercostal veins within the thorax before it empties into the left subclavian vein. In the anatomic laboratory at Johns Hopkins University, Lee demonstrated some years ago that the thoracic duct of the cat may be ligated without untoward effect; anastomotic communications with the right bronchomediastinal lymph trunk and with adjacent intrathoracic veins served to transport the lymph from the receptaculum chyli to the venous system. In this instance the absence of such anastomotic channels accounts satisfactorily for the chylous ascites.

It may logically be asked whether this condition might have been remedied could it have been identified. Had Dr. McQuarrie asked us to operate on this patient, there is no doubt that we would have explored the wrong cavity. The most frequent causes of chylous ascites are, as Dr. Hilleboe has said, lesions within the abdomen. On the whole, surgical intervention only helps to clarify the etiologic agent of these lesions, without affording therapeutic relief.

There is adequate precedent in surgical intervention performed for injury of the lymphatic channels for the type of operation that might have been done here, had the nature of the lesion been apparent. After wounding the thoracic duct, while excising tuberculous lymph nodes in the neck, Deansley, in 1903, divided the internal jugular vein and implanted the thoracic duct in the proximal end of the vein, a tie being placed about the vein to insure hemostasis. Harrison, in 1916, reported a similar implantation of the divided cervical portion of the thoracic duct in the external jugular vein, which he turned down to receive the injured lymph channel.

As the greater part of the lymphatic drainage from the peritoneal cavity occurs by way of the right bronchomediastinal lymph trunk, one might ask: May not some of this fatty transudate, in the presence of normal serous peritoneal surfaces, be obsorbed again by the unobstructed lymphatic channels?

GROWTH IN AREA OF CUTANEOUS REACTIONS TO OLD TUBERCULIN AND PURIFIED HUMAN TUBERCLE BACILLUS PROTEIN. DR. CHESTER A. STEWART.

Intradermal injections of 0.1 cc. of a 1:5,000 solution of old tuberculin (0.02 mg.) and 0.1 cc. of purified human tubercle bacillus protein (0.001 mg.) were given simultaneously to 100 tuberculin-sensitive children ranging from 8 to 17 years of age. The group included some children with a history of negative roentgen findings and others with calcified hilar glands or Ghon tubercles. No child was included in whom any reinfection type of tuberculosis (phthisis and other forms) was demonstrable roentgenographically or clinically. The average area for the reactions (determined by the area-by-weight method), when fully developed, amounted to 18.3 and 18.6 sq. cm., for tests with the old tuberculin and the purified human tubercle bacillus protein, respectively. In the dosage used, therefore, the two materials produced reactions of approximately equal average maximum area. The standard deviation of the measurements on each series of

tests was quite large, 14 sq. cm. (old tuberculin) and 12.3 sq. cm. purified human tubercle bacillus protein). Thus it is evident that the degree of hypersensitiveness to tuberculoprotein produced in children by infections with tubercle bacilli varies a great deal. This variability renders predictions relative to how allergic an infected child may prove to be, when tested, impossible.

The standard errors determined for the observations on tests with the old tuberculin and the purified human tubercle bacillus protein were 1.4 and 1.2 sq. cm., respectively. This determination establishes limits within which the average maximum area of reaction may be expected to fall in approximately two thirds of the cases if other comparable groups of infected children are tested with old tuberculin or with purified human tubercle bacillus protein in doses identical to those employed in this study. In other words, one may state with reasonable accuracy that tuberculous infections comparable with those of the subjects in the series studied render children allergic to tuberculoprotein to such a degree that Mantoux tests on groups of 100 subjects each with either 0.02 mg. of old tuberculin or 0.001 mg. purified human tubercle bacillus protein, may be expected to produce areas of reaction the maximum extent of which will average 18 sq. cm. ($\pm$ 8 per cent) per group in the majority of instances.

At corresponding successive intervals of twenty-four hours following the injection of tuberculin, the average area of the reactions to each of the two materials used was found to be practically the same.

As used in this study, therefore, old tuberculin and the purified active principle produced reactions which were practically identical with respect to the average maximum size attained and the type of growth curve characteristic of the phases of increase and decline in the area of the reaction.

DISCUSSION

DR. IRVINE MCQUARRIE: I think that this study by Dr. Stewart is important in view of the fact that an effort is being made by some members of organizations for the prevention and cure of tuberculosis to substitute purified human tubercle bacillus protein, which is very expensive, for old tuberculin. I think that Dr. Stewart's data show clearly that equally reliable results are obtained with both. Of course, preference for old tuberculin in daily practice does not detract from the scientific value of the admirable work that has been done by Siebert and others in isolating the active substance in crystalline form and in standardizing the dosage.

DIABETES INSIPIDUS: A STUDY OF THE WATER AND MINERAL EXCHANGES.

DR. W. H. THOMPSON, DR. R. M. JOHNSON and DR. IRVINE MCQUARRIE.

The complete water and mineral balances were determined under a variety of experimental conditions in two typical, uncomplicated cases of diabetes insipidus. The total metabolism and the proportion of the intake of water to its excretion were measured under standard conditions according to the procedures outlined by Newburg.

Both patients responded sensitively to the antidiuretic principle from the pituitary body. Both were found to have (according to a tentative interpretation of the results obtained) an abnormally low reserve of readily available fluid in the water depots of the body. The latter fact is suggested as an explanation for the characteristic appearance of emaciation in these patients and for the promptness with which excessive thirst appeared following restriction of their intake of water, when this was not accounted for by primary polyuria. The younger patient had typical epileptiform convulsions on several occasions when a positive water balance developed following the intranasal administration of the pituitary extract. The volume of water stored under these conditions was not of the magnitude ordinarily required for the production of the syndrome of "water intoxication" in normal animals. A negative potassium balance and other

changes indicated a disturbance in the equilibrium between the various electrolytes of the body fluids during the period of water storage.

The abrupt withdrawal of 6,000 Gm. of drinking water from the older patient, who habitually took 7,000 Gm. daily, resulted in an immediate diminution in urinary output from 6,500 to 600 Gm. within twenty-four hours and a rise in the specific gravity of the urine from 1.002 to 1.020. The insensible loss of water and the total loss in body weight were relatively small. In spite of this, severe thirst developed comparatively early and was accompanied by headache and muscular tremors. The mineral balance remained slightly positive during the period when the amount of water was restricted, as in the preceding control period. With resumption of the regular intake of water, the urinary output of water rose to within 800 Gm. of the intake on the first day, and the specific gravity of the urine returned to 1.002. These responses indicate that polydipsia, and not polyuria, was the primary factor in this particular instance. When the establishment of a positive water balance was followed by the administration of an antidiuretic pituitary extract (pitressin), the second patient did not seriously object to a restriction in the amount of water comparable to that which caused almost insufferable thirst in the patient in the experiment previously described, so long as small doses of the pituitary extract were given at six hour intervals. The pitressin tended to control the thirst, and the surplus water stored during the preliminary period was apparently utilized efficiently during the period when the amount of water was restricted.

DISCUSSION

DR. R. M. JOHNSON: The increase in the excretion of potassium in the urine in these patients with diabetes insipidus under the influence of pitressin was striking. I should like to ask whether there is a similar increase in the excretion of potassium in patients with cardiac disease and nephrosis when diuresis occurs. Why does diuresis result from the intake of potassium chloride in cases of nephrosis and cardiac edema?

DR. IRVINE MCQUARRIE: When diuresis occurs in a patient with nephrosis following the withdrawal of pitressin, a large negative potassium balance is not observed. The water and minerals excreted by this patient consist of extracellular fluid containing chiefly sodium and chlorine. The diuretic effect of potassium salts in nephrotic and cardiac edema is thought to be due to the fact that potassium is not interchangeable with sodium in the extracellular fluid and so must be promptly excreted. Thus, edema fluid is excreted with the potassium.

DR. THOMAS MYERS: Would either of these patients show changes in the electrolytes of the blood?

DR. IRVINE MCQUARRIE: The electrolytes of the blood were not determined in these patients. However, in general, the blood chlorides tend to be low because of the marked excretion in the urine. Under the influence of pitressin, various electrolytes are mobilized from the tissues in the blood; this favors increased excretion, in spite of the retention of water. Also, the kidney threshold for sodium and chloride may be lowered by the pituitary extract.

DR. THOMAS MYERS: Have roentgen studies shown any changes in the structure of the bones?

DR. IRVINE MCQUARRIE: The skull, sella turcica and long bones were normal in both patients.

DR. A. D. HIRSCHFELDER: Would the excretion of magnesium compare with that of sodium, potassium and chlorine?

DR. IRVINE MCQUARRIE: Stehle has shown that the injection of pituitary extract results in an increased excretion in the urine of magnesium, as well as of the other fixed bases. He believes that diuresis is a result of the accumulation of these salts in the blood in abnormally high concentration, owing to the inability of the tissues to retain them.

DR. F. C. RODDA: Did the younger patient have any convulsions previous to the administration of the pituitary extract?

DR. IRVINE MCQUARRIE: No, not to our knowledge. In this respect the patient reacted more like a person with epilepsy than a normal subject. It has often been thought that a patient with severe epilepsy who responds favorably to restriction in the amount of water taken might be cured by the spontaneous development or the surgical production of severe diabetes insipidus, in which there is a potential deficit of water at all times. Since this patient has repeatedly had generalized convulsions following the establishment of a much smaller positive water balance than that ordinarily required to induce the convulsions of "water intoxication" in normal animals, we have entertained the thought that she might have epilepsy, which is prevented from manifesting itself during periods of uncontrolled polyuria.

PHOSPHATASE ACTIVITY IN OSTEOGENESIS IMPERFECTA. DR. ARILD E. HANSEN and DR. MILDRED R. ZIEGLER.

The plasma phosphatase of four patients with osteogenesis imperfecta was found to be within the same range as in ten control determinations. The response to parathormone was manifested by a lowering of the plasma phosphatase together with an increase of the serum calcium, while the serum inorganic phosphorus was either slightly decreased or remained unchanged. Viosterol 10,000 X, given in doses of 0.1 cc. daily, produced a response similar to but more delayed than that produced by parathormone. Both responses seem to be normal.

Owing to the sudden death of one patient with osteogenesis imperfecta, an unusual opportunity was given to study the phosphatase activity in tissues. The relative phosphatase activity in the various organs seemed to be essentially normal, except in the duodenum, where there was none. We were surprised to find no sign of activity in the periosteal and subperiosteal regions, which are usually areas of great activity. We expect to correlate these observations with the mineral content of the bone which has been determined. The phosphatase activity in the callus was found to be relatively increased.

It is postulated that the lack of phosphatase activity in the periosteal region may account for the presence of the extremely thin cortex in osteogenesis imperfecta.

DISCUSSION

DR. IRVINE MCQUARRIE: Dr. Hansen and Dr. Ziegler are to be congratulated on the persistence with which they have studied this difficult problem. If the finding of low phosphatase activity in the periosteal tissue is characteristic of this bizarre disorder, this deficiency may well be the primary etiologic factor. Since callus formation following fracture of a bone is essentially normal in this condition, it is probable that there is a temporary mobilization of phosphatase at the site of injury.

DR. MILDRED R. ZIEGLER: The etiology of this condition is hypothetic. Although many explanations have been advanced, none has solved the problem. I wish to call attention to the fact that the material presented offers a new conception of the etiology of osteogenesis imperfecta which seems to support Robison's theory of the calcification of bone. Since our studies of the blood support those of previous investigators and give essentially normal findings, the significant observation is the apparently low phosphatase content of the bone, especially of the periosteum. Ossification is influenced by local factors presumably associated with cellular activity in the osseous tissue, which regulates the deposition of the calcium salts. It is difficult to say at this time whether phosphatase controls the proper functioning of the local biologic processes which direct this precipitation. If so, one must explain how the process, once started, would ever cease, unless some antienzyme is formed in osteogenesis imperfecta which inhibits the action of phosphatase. There are many problems connected with this condition which are well worthy of further study.

MOTOR AUTOMATISMS OF CHILDREN. DR. MAX SEHAM.

The method of direct observation and quantitative measurement of motor automatisms was used in a study of 57 children. The data thus gathered were related with associated factors such as sleep, food, general health, physical status and functional signs. Statistical analysis of the material yielded the following data:

1. The highest number of movements observed were those of touching the mouth (1,311); the lowest number were movements of the hands to the ear (76).

2. For girls, the incidence was higher with respect to the mouth, hair and biting of the finger-nails.

3. For boys, the incidence was higher with regard to blinking, motor restlessness, yawning, grimaces and movements relating to the fingers, nose and ears.

4. Grimaces and tics relating to the mouth, hair and feet occurred more frequently in the afternoon, while motor restlessness, blinking, yawning and movements relating to the fingers, nose and ears were more prevalent in the morning.

5. The average number of movements in the 12 year old children was 3.88 for the boys and 4.6 for the girls; the average number for the 15 and 16 year old children was 5.05.

6. Tics were neither specific nor constant, the range of score varying from 1 to 18.

7. Significant relationships (determined by the use of Pearl's table) obtained between automatisms relating to the head and motor automatisms and fatigue and nervousness (116:1).

8. Positive tendencies were evident in the following relationships:
   - (*a*) Average total number of tics and inadequate sleep (4:1)
   - (*b*) Average total number of tics and inadequate food (2.6:1)
   - (*c*) Movements relating to the mouth and fingers and tics relating to the face and fatigue and nervousness (2:4:1)
   - (*d*) Tics relating to the head and fatigue and nervousness (7:1)
   - (*e*) Average total number of tics and movements relating to the eyes (8.48:1)
   - (*f*) Motor restlessness and movements relating to the eyes (2.57:1)
   - (*g*) Motor restlessness and inhibition (2.57:1)
   - (*h*) Average total number of tics and inhibition (2.57:1)
   - (*i*) Motor restlessness and speech (2.2:1)
   - (*j*) Average total number of tics and speech (1.39:1)
   - (*k*) Movements relating to the mouth and circulatory signs (2.21:1)
   - (*l*) Average total number of tics and circulatory signs (less than 1:1)

9. All motor automatisms are not signs of chronic pathopsychologic states.

10. Tics may be classified on the basis of the following four groups:
    - (*a*) Manifestations of a psychopathologic state (provided that they are definitely accompanied by other signs and symptoms of such a state)
    - (*b*) Motor manifestations of physiopsychologic innervation
    - (*c*) Motor manifestations of acute or chronic fatigue
    - (*d*) Conditioned reflexes resulting from physical or psychologic irritants

DISCUSSION

DR. HYMAN LIPPMAN: I should like to ask about these 57 children. Do you know who they are, or were they picked at random?

DR. MAX SEHAM: They were picked as they sat in their seats. I examined them carefully and made myself familiar with the family history, the physical state and all the facts which I thought were necessary to know.

DR. HYMAN LIPPMAN: Under what conditions and where did you examine them?

DR. MAX SEHAM: For the abnormal group, I studied the children of the Child Guidance Clinc and those whose conditions were diagnosed as hyperkinetic.

DR. HYMAN LIPPMAN: Did you study them there?

DR. MAX SEHAM: Yes, and also privately in the office.

DR. HYMAN LIPPMAN: One would expect a much larger number of movements in the children of the second group. Might the absence of this difference be due to the fact that they were examined under different conditions? It seems to me that it would be of more value to study this group in the schoolroom, under conditions similar to those under which the first group was studied.

DR. MAX SEHAM: That is true.

DR. HYMANN LIPPMAN: Then, too, it might be interesting to examine an equal number of children whom one would classify as normal, well adjusted children, rather than 57 children of a group taken at random, because among this first group there may be a large percentage of children who belong to the group you tried to study.

DR. MAX SEHAM: I ruled those out. The 57 children were selected on the basis of what I determined to be normal children, that is, children whose grades were high, whose general health was good and who were otherwise normal. But the first question is well taken. I was greatly surprised to find such a small number of movements in children who had been classed as abnormal.

DR. F. C. RODDA: Fatigue should be considered, and statistics as to adequate food and sleep would be a factor in this study.

DR. MAX SEHAM: Food seems to play no rôle in regard to tics. I have more data on the relationship of fatigue and nervousness to tics. I have two more slides on this subject, but I did not show them.

OBSTRUCTIVE LARYNGITIS: A CRITICAL ANALYSIS OF 352 CASES. DR. E. S. PLATOU and DR. H. E. HILLEBOE.

This article will be published in full in a later issue of the AMERICAN JOURNAL OF DISEASES OF CHILDREN.

Book Reviews

The Physiological Effects of Radiant Energy. By Henry Laurens, Ph.D. American Chemical Society Monograph. Price, $6. Pp. 593, with 104 illustrations and 80 tables. New York: The Chemical Catalog Company, Inc., 1933.

The author of this monograph has attempted, and with success, to give a comprehensive review of the extensive literature on this subject. A chapter on the physics of radiant energy characterizes sunlight radiation at various latitudes, altitudes, seasons and hours of the day, compares the radiation from various commonly used artificial sources with that from sunlight, and discusses the modern tendency to use substitutes for ordinary window glass which are more transparent to the ultraviolet rays.

The book includes chapters on the effects of radiant energy on the skin, wounds and some cutaneous diseases, the eye, the blood and circulatory system, metabolism, the body temperature, respiration and reactions of the blood, photodynamic sensitization, tuberculosis and bacteria, toxins, antitoxins, proteins and ferments. The chapters on metabolism pay particular attention to the effect on calcium and phosphorus metabolism, rickets, tetany and growth and to the therapeutic value of various irradiated substances.

Frequent mention is made of the clinical applications of the subject, but the reader is impressed by the facts that while investigators agree on the great possibilities of heliotherapy or phototherapy, the real mode of action of radiant energy and its component parts is still unknown, that as yet there is no generally accepted method of measuring dosage, and that many of the beneficial effects attributed to irradiation may have been the result of fresh air, wind, temperature, altitude, humidity, rest and food.

The inconclusiveness of many of the statements and the many contradictions between experimental and therapeutic results point to the need for much further quantitative, carefully controlled work on the subject. One must also remember, as the author suggests, that experimental observations are made on healthy men and animals, while therapeutic results are obtained on diseased persons who are much more susceptible to irradiation, and, likewise, that the effect of irradiation on an experimental animal should necessarily differ from that on man because of differences in the skin.

The book is one which should be valuble to many, among them the general practitioner, internist, pediatrician, surgeon, bacteriologist, zoologist, alienist and physicist. It is especially useful because of a complete bibliography and an author and subject index.

Der dialektische Materialismus und die klinische Medizin. By J. Lifschitz. Pp. 80. Kharkov: Medwydaw, 1932.

This treatise is published under the direction of the All-Ukraine Society for the Furtherance of Cultural Relations with Foreign Countries. The author discusses dialectic materialism and the relation of the physician to society and government. Naturally, the author's point of view is that of the soviet government. Those interested in this subject are referred to the original article.

Directory of Pediatric Societies

INTERNATIONAL

International Association of Preventive Pediatrics

President: Professor Taillens, Lausanne, Switzerland.
Secretary: Dr. P. Oltramare, rue Decandolle, Geneva, Switzerland.

FOREIGN

Royal Society of Medicine, Section for the Study of Disease in Children

President: Dr. Leonard G. Parsons, 58, Calthorpe Road, Birmingham, England.
Secretary: Dr. W. G. Wyllie, 33, Wimpole St., W. 1, London.

NATIONAL

American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman Dr. Alfred A. Walker, Highland Plaza Apartments, Birmingham, Ala.
Secretary: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.
Place: Cleveland. Time: June 11-15, 1934.

American Academy of Pediatrics

President: Dr. John Ruhräh, 11 E. Chase St., Baltimore.
Secretary: Dr. C. G. Grulee, 636 Church St., Evanston, Ill.
Place: Cleveland. Time: June 11-12, 1934.

American Child Health Association

President: Dr. Samuel McC. Hamill, 1822 Spruce St., Philadelphia.
Secretary: Dr. Philip Van Ingen, 125 E. 71st. St., New York.

American Hospital Association, Section on Children's Hospitals

President: Dr. H. C. Schumm, 425 E. Wisconsin Ave., Milwaukee.
Secretary: Miss Sophie Yoerg, 721 N. 17th St., Milwaukee.

American Pediatric Society

President: Dr. Charles A. Fife, 2104 Spruce St., Philadelphia.
Secretary-Treasurer: Dr. Hugh McCulloch, 325 N. Euclid, St. Louis.
Place: Asheville, N. C. Time: May, 1934.

Canadian Society for the Study of Diseases of Children

President: Dr. Frederick F. Tisdall, 170 St. George St., Toronto, Ontario.
Secretary-Treasurer: Dr. T. G. H. Drake, 67 College St., Toronto, Ontario.

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*Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

Society of Pediatric Research

President: Dr. Rustin McIntosh, College of Physicians and Surgeons, Columbia University, New York.
Secretary-Treasurer: Dr. Charles F. McKhann, Harvard Medical School, Boston.
Place: Atlantic City, N. J. Time: May, 1934.

SECTIONAL

North Pacific Pediatric Society

President: Dr. Herbert E. Coe, 509 Olive St., Seattle.
Secretary: Dr. Raymond H. Somers, Cobb Bldg., Seattle.

Southern Medical Association, Section on Pediatrics

Chairman: Dr. Hugh L. Dwyer, 406, W. 34th St., Kansas City, Mo.
Secretary: Dr. Luther W. Holloway, 117 W. Duval St., Jacksonville, Fla.
Place: Richmond, Va. Time: Nov. 14-17, 1933.

STATE

Alabama Pediatric Society

President: Dr. C. E. R. Parker, 401 S. Court St., Montgomery.
Secretary-Treasurer: Dr. John W. Simpson, 1117 S. 22d St., Birmingham.

Georgia Pediatric Society

President: Dr. Joseph Yampolsky, 311 Doctors Bldg., Atlanta.
Secretary-Treasurer: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.
Place: Atlanta. Time: October, 1933. Augusta. Time: May, 1934.

Louisiana State Pediatric Society

President: Dr. Cecil O. Lorio, 245, 3d St., Baton Rouge.
Secretary-Treasurer: Dr. Maud Loeber, Tulane University, New Orleans.

Medical Society of State of New York, Section on Pediatrics

Chairman: Dr. Adolph G. De Sanctis, 12 E. 11th St., New York.
Secretary: Dr. George M. Retan, 459 James St., Syracuse.

Michigan State Medical Society, Pediatric Section

Chairman: Dr. W. A. Collins, 103 W. Burdick St., Kalamazoo.
Secretary: Dr. Edgar E. Martmer, 749 David Whitney Bldg., Detroit.
Place: Battle Creek. Time: September, 1934.

Nebraska Pediatric Society

President: Dr. W. O. Colburn, 724 Sharp Bldg., Lincoln.
Secretary-Treasurer: Dr. C. G. Weigand, 1614 Medical Arts Bldg., Omaha.
Place: As announced by committee. Time: Second Thursday of each month from October to June, inclusive. Dinner at 6 p. m.

North Carolina Pediatric Society

President: Dr. J. Buren Sidbury, 15 N. 5th St., Wilmington.
Secretary: Dr. E. K. McLean, 121 W. 7th St., Charlotte.
Place: Various children's hospitals. Time: Twice a year.

Oklahoma State Pediatric Society

President: Dr. Clark H. Hall, 117 N. Broadway, Oklahoma City.
Secretary: Dr. M. J. Searle, 108 W. 16th St., Tulsa.

South Carolina Pediatric Society

President: Dr. J. I. Waring, 77 Rutledge Ave., Charleston.
Secretary-Treasurer: Dr. Julian P. Price, Medical Bldg., Florence.

Tennessee State Pediatric Society

President: Dr. Owen H. Wilson, 706 Church St., Nashville.
Secretary: Dr. Joe T. Smith, 511 W. Church Ave., Knoxville.

Texas Pediatric Society

President: Dr. Sidney R. Kaliski, Moore Bldg., San Antonio.
Secretary-Treasurer: Dr. Frank M. Martin, 321 Medical Arts Bldg., San Antonio.
Place: San Antonio. Time: Oct. 28, 1933.

Virginia Pediatric Society

President: Dr. J. B. Stone, 2042 Park Ave., Richmond.
Secretary-Treasurer: Dr. Thomas D. Jones, Medical Arts Bldg., Second and Franklin Streets, Richmond.

West Virginia State Medical Society, Section on Pediatrics

President: Dr. R. C. Hood, 428 W. Pike St., Clarksburg.
Secretary: Dr. Russell C. Bond, 1325 Chapline St., Wheeling.

LOCAL

Academy of Medicine of Cleveland, Pediatric Section

Chairman: Dr. C. W. Burhans, 14805 Detroit Ave., Lakewood, Ohio.
Secretary: Dr. J. A. Garvin, 2009 Adelbert Road, Cleveland.
Place: 2009 Adelbert Road. Time: Four meetings, from September to May.

Academy of Medicine, Toronto, Section of Pediatrics

President: Dr. Gladys Boyd, 56 DeLisle St., Toronto.
Secretary: Dr. Lawrence Murray, 1870 Bloor St., W., Toronto.

Bronx Pediatric Society

President: Dr. Edward L. Benjamin, 2021 Grand Concourse, New York.
Secretary: Dr. Harry M. Schapiro, 1882 Grand Concourse.
Place: Concourse Plaza, 161st St. and Grand Concourse. Time: Every Second Wednesday of each month, except June, July, August and September.

Brooklyn Pediatric Society

President Dr. Carl H. Laws, 12 Pierrepont St., Brooklyn.
Secretary: Dr. Lewis A. Koch, 62 Pierrepont St., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Last Wednesday of each month, except June, July and August.

Central New York Pediatric Club

President: Dr. Frank Vander Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Fourth Thursday of October, January and April.

Chicago Pediatric Society

President: Dr. Charles Schott, 48 W. Division St., Chicago.
Secretary: Dr. Bert I. Beverly, 8 S. Michigan Ave., Chicago.
Place: City Club. Time: Third Tuesday of each month.

Dallas County Pediatric Society

President: Dr. P. E. Luecke, 4105 Live Oak St., Dallas, Texas.
Secretary: Dr. R. S. Usry, 1835 Garrett Ave., Dallas, Texas.
Place: Bradford Memorial Hospital. Time: 1 p. m., first and third Saturdays of each month.

Detroit Pediatric Society

President: Dr. John A. Johnston, 2799 W. Grand Blvd., Detroit.
Secretary: Dr. Edgar E. Martmer, 749 David Whitney Bldg., Detroit.
Place: Wayne County Medical Society. Time: 8:30 p. m., first Wednesday of each month.

Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.
Secretary: Dr. T. I. Willingham, 478 Peachtree St., N. E., Atlanta.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: Second Thursday of each month from October to April, 8 p. m.

Intermountain Pediatric Society

President: Dr. Helmina Jeidell, 11 Exchange Pl., Salt Lake City, Utah.
Secretary-Treasurer: Dr. Edwin R. Murphy, 9 Exchange Pl., Salt Lake City, Utah.
Place: Salt Lake City, General Hospital. Time: First Thursday of each month, 8 p. m.

Kansas City (Missouri) Pediatric Society

President: Dr. Hugh L. Dwyer, 406 W. 34th St., Kansas City.
Secretary: Dr. John Aull, 906 Grand Ave., Kansas City.

Memphis Pediatric Society

President: Dr. R. B. McCormick, 1074 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. W. D. Mims, 1024 Madison Ave., Memphis, Tenn.
Place: Memphis General Hospital. Time: Second Tuesday of each month.

Milwaukee Pediatric Society

President: Dr. Karl E. Kassowitz, 709 N. 11th St., Milwaukee.
Secretary: Dr. John H. Reynolds, 747 N. 27th St., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

New England Pediatric Society

President: Dr. Thomas A. Foster, 131 State St., Portland, Maine.
Secretary: Dr. Gerald Hoeffel, 319 Longwood Ave., Boston.
Place: Boston Medical Library. Time: Four meetings a year, occurring from September to May.

New York Academy of Medicine, Section of Pediatrics

Chairman: Dr. Martha Wollstein, Babies' Hospital of City of New York, New York.
Secretary: Dr. Harry Bakwin, 132 E. 71st St., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

Northern California Pediatric Society

President: Dr. Lloyd Hardgrave, 384 Post St., San Francisco.
Secretary-Treasurer: Dr. Roland P. Seitz, 490 Post St., San Francisco.

Northwestern Pediatric Society

President: Dr. Alexander Stewart, 459 Lowry Medical Arts Bldg., St. Paul.
Secretary: Dr. E. F. Robb, 1801 Lyndale Ave., S., Minneapolis.

Philadelphia Pediatric Society

President: Dr. Joseph Stokes, 159 W. Coulter St., Philadelphia.
Secretary: Dr. James E. Bowman, 4091 Comly St., Philadelphia.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to June, inclusive.

Pittsburgh Pediatric Society

President: Dr. Henry C. Flood, 119 S. Highland Ave., Pittsburgh.
Secretary: Dr. E. R. McCluskey, Highland Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate months from October to April, inclusive.

Richmond Pediatric Society

President: Dr. F. Waring Lewis, Professional Bldg., Richmond, Va.
Secretary-Treasurer: Dr. A. S. Hurt, Jr., 2618 Grove Ave., Richmond, Va.
Place: Richmond Academy of Medicine, 1200 E. Clay St. Time: First Thursday of each month (except July, August and September).

Rochester Pediatric Society

President: Dr. H. F. Rowley, 176 S. Goodman St., Rochester, N. Y.
Secretary: Dr. J. M. Parker, 26 S. Goodman St., Rochester, N. Y.
Place: Arranged by program committee. Time: Second Friday of each month from October to May.

Rocky Mountain Pediatric Society

President: Dr. J. A. Schoonover, Republic Bldg., Denver.
Secretary: Dr. Arthur L. Esserman, Republic Bldg., Denver.
Place: Children's Hospital, Denver. Time: First Saturday of each month from September to May, inclusive, 7 p. m.

St. Louis Pediatric Society

President: Dr. Hugh McCulloch, 325 N. Euclid Ave., St. Louis.
Secretary-Treasurer: Dr. Katherine Bain, Beaumont Bldg., St. Louis.
Place: St. Louis Medical Society. Time: Third Friday of every month.

Seattle Pediatric Society

President: Dr. Albert S. McCown, 509 Olive St., Seattle.
Secretary: Dr. Frank H. Douglass, Medical-Dental Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 7 p. m.

Southwestern Pediatric Society

President: Dr. James E. Harvey, 60 S. Lake Ave., Pasadena, Calif.
Secretary: Dr. E. Earl Moody, 3780 Wilshire Blvd., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. Gustave F. Weinfeld, Moraine Hotel, Highland Park, Ill.
Secretary: Dr. John P. Parsons, 320 S. Division St., Ann Arbor, Mich.
Place: Ann Arbor Mich. Time: November, 1933.

American Journal of Diseases of Children

VOLUME 46 NOVEMBER, 1933—PART I NUMBER 5

THE BODY BUILD FACTOR IN THE BASAL METABOLISM OF CHILDREN

WILLIAM PALMER LUCAS, M.D.
AND
HELEN BRENTON PRYOR, M.D.
SAN FRANCISCO

A definite relationship between body build and oxygen absorption in children appears in our study of the basal metabolic rate of 573 normal children.

In our series slender-built children normally have higher basal rates than broad-built children of the same age-sex group. High basal metabolic rates as measured by the conventional standards are the rule for the linear type group, whose [1] width-length indexes of body build are well below average.

To test the effect of body build on basal metabolism, we have compared the width-length index with the basal metabolic rate for each of the age-sex groups from 4 to 15 years. The basal metabolic rate was calculated from the Benedict-Talbot standard whenever possible, and from the Harris-Benedict and Aub-duBois standards for boys above 38 Kg. and girls above 58 Kg. of body weight. For clinical interpretation of our data, we have corrected the rates as indicated by our own mean basal rates for the 573 normal children as suggested by Jenkins.[2] The width-length index is an expression of the relationship of the width to the length of the body. It is obtained by measuring the diameter of the crest of the ileum and the standing height. The crest measurement is divided by the height to give the relative breadth of the body, or width-length index. This index represents width in per cent of standing height. Weight does not enter into the calculation. The size of the index increases with the relative breadth of the body. These width-length indexes were plotted against the basal metabolic rates, and the Pearson coefficient of correlation was computed (indicated by r). The computations on boys and girls were made separately, and the children were further subdivided into preadolescent and adolescent groups, ages from 3 to 9 years and from 10 to 18 years.

Read before the Western Section (Region IV) of the American Academy of Pediatrics, Oct. 21, 1932.

1. Lucas, W. P., and Pryor, Helen B.: Physical Measurements and Physiological Processes in Young Children, J. A. M. A. **97**:1127 (Oct. 17) 1930.

2. Jenkins, R. L.: Basal Metabolism Standards, a Statistical Comparison of Their Prediction Values, J. Nutrition **4**:305 (Sept.) 1931.

The correlations between basal metabolic rates and width-length indexes for preadolescent and adolescent children are as follows:

131 girls	ages 3-9 years	equals —0.266 : ±0.054
92 boys	ages 3-9 years	equals —0.197 : ±0.043
103 girls	ages 10-18 years	equals —0.492 : ±0.050
92 boys	ages 10-18 years	equals —0.158 : ±0.069

These correlations are all negative and show that the large width-length indexes are associated with the low basal metabolic rates and the small indexes with the high basal rates. This relationship is most marked for adolescent girls and is more marked for girls than for boys.

Table 1 compares a broad-built boy with a slender-built boy of the same age, and a broad-built girl with a slender-built girl of the same age, for each age from 4 to 15 years. It will be seen that not only (1) the basal rate, but also (2) the total calories per hour, the (3) calories per kilogram of body weight per hour and (4) the calories per square meter of body surface per hour are greater for the slender-built than for the broad-built children in each age-sex group. This is true when the two children compared are practically the same weight, as in cases 93 and 466 (4 year old boys), in cases 22 and 192 (12 year old boys) and in cases 131 and 364 (12 year old girls). It is also true when the two children compared are practically the same height, as in cases 266 and 327 (14 year old boys) and in cases 139 and 290A (10 year old boys). It is also true when the two children compared have practically the same body surface area, as in cases 14 and 115 (8 year old girls) and in cases 131 and 364 (12 year old girls).

The question might be raised concerning some other factor than body build being responsible for these differences in a small, highly selected group of children. It is true that these children were chosen for comparison because one of each pair was very slender-built for his age and the other member of the pair because he was very broad-built for his age.

In order to measure the amount of this relationship between relative breadth of the body and oxygen absorption, in the whole series, averages were found for each age-sex group for calories per kilogram of body weight per hour. These averages are presented in table 2. Each child's percentage variation from his own age-sex group average was then found and plotted against his percentage variation from the average width-length index for his age-sex group, presented in table 3.

For example, an 8 year old boy (case 155) consumed 2.43 calories per kilogram of body weight per hour in his metabolism test (table 1). This is 40 per cent more than 1.74 (the average for the forty-four 8 year old boys in this series). His width-length index was 150, which is

5 per cent less than 158 (the average for the two hundred 8 year old boys from which the average width-length indexes were calculated) (table 3). For this boy + 40 was plotted on the graph for calories per kilogram and — 5 for width. The data for each child were plotted in a similar manner.

TABLE 1.—*Body Build Factor in Basal Metabolism of Children*

Case Number	Age	Sex	Height	Weight	Variation from Average Weight, per Cent	Width-Length Index	Index Variation, per Cent	Body Surface in Square Meters	Calories per Square Meter	Basal Metabolic Rate	Calories per Hr.	Calories per Kg. per Hr.
39.....	3	F	39¾	32½	— 6.4	163	— 1	0.62	54.2	+11.5	33.6	2.04
409.....	3	F	37¼	38¼	+13.8	182	+10	0.62	44.5	—10.0	27.6	1.60
93.....	4	M	40½	33	—10.8	148	— 8	0.63	57.4	+20.0	36.2	2.41
466.....	4	M	42¾	32¾	— 1.3	168	+ 4	0.64	46.4	— 3.0	29.7	2.00
339.....	4	F	31¾	31	+ 2.0	147	—10	0.52	62.5	+17.2	32.5	2.32
409a.....	4	F	41¾	58¾	+15.0	182	+10	0.83	37.2	—23.3	30.9	1.16
143.....	5	M	43	35½	—12.1	156	— 3	0.64	67.2	+36.0	43.0	2.69
168.....	5	M	46½	58	+20.8	173	+ 4	0.91	43.7	— 7.0	39.8	1.51
564.....	5	F	46¾	38	—21.0	149	— 7	0.75	53.0	+28.8	39.7	2.31
427.....	5	F	44½	43¼	+ 1.0	164	+ 2	0.77	41.4	— 3.6	31.9	1.11
527.....	6	M	45¾	42½	—10.3	154	— 3	0.78	58.1	+29.4	45.3	2.36
349.....	6	M	47½	57½	+12.6	161	+ 1	0.92	35.3	—23.7	32.5	1.25
118.....	6	F	46	46½	— 1.0	147	— 6	0.81	54.8	+28.0	44.4	2.10
86.....	6	F	48½	53½	+ 1.0	170	+ 7	0.90	43.2	— 0.5	38.8	1.60
381A.....	7	M	49	45½	—17.2	142	—10	0.85	54.8	+28.0	46.6	2.26
505.....	7	M	48	56	+ 5.6	164	+ 4	0.92	41.4	— 8.6	38.1	1.50
351.....	7	F	46½	36¾	—24.2	156	— 2	0.71	60.7	+37.7	43.1	2.58
104.....	7	F	50	64	+13.1	163	+ 3	1.00	37.1	—11.0	37.1	1.27
155.....	8	M	46¾	43¼	—12.6	150	— 5	0.80	59.4	+33.0	47.5	2.43
374.....	8	M	54¾	62	—11.8	162	+ 2	1.04	37.0	—13.8	38.5	1.37
14.....	8	F	52	55½	—13.2	138	—12	0.98	49.4	+24.1	48.4	1.92
115.....	8	F	50	59½	+ 4.3	166	+ 4	0.97	40.8	— 3.0	39.6	1.46
58a.....	9	M	55	55½	—23.6	150	— 5	1.01	57.6	+28.5	58.2	2.31
34.....	9	M	48	60	+ 1.0	166	+ 5	0.95	47.4	+ 3.4	45.1	1.66
387.....	9	F	50¼	56	— 3.4	149	— 6	0.95	50.6	+22.7	48.1	1.89
120.....	9	F	56	85½	+11.0	159	+ 1	1.23	34.3	—16.9	42.2	1.09
290a.....	10	M	54¼	63¾	—11.0	148	— 6	1.05	51.0	+18.0	53.6	2.18
139.....	10	M	54	83½	+35.0	180	+14	1.19	42.0	— 5.4	50.0	1.32
33.....	10	F	48¾	50	— 8.2	148	— 6	0.90	48.8	+20.9	44.0	1.94
9.....	10	F	57	101	+18.8	168	+ 5	1.35	31.2	—18.5	42.2	0.92
140.....	11	M	57¾	81	— 3.5	138	—12	1.23	46.5	+ 9.0	57.2	1.56
250.....	11	M	62½	125½	+22.0	163	+ 5	1.57	33.7	—18.3	53.0	0.93
181.....	11	F	57½	76½	— 9.0	150	— 6	1.20	49.0	+25.4	59.3	1.71
123.....	11	F	55½	90	+17.0	165	+ 3	1.25	28.0	—30.0	35.8	0.87
22.....	12	M	63¼	92½	—13.1	137	—12	1.39	46.6	+15.0	64.8	1.55
192.....	12	M	59½	91	+ 1.0	160	+ 2	1.33	32.5	—20.0	43.2	1.04
131.....	12	F	63½	96½	—14.0	148	— 8	1.43	41.6	+13.4	59.6	1.37
164.....	12	F	59½	96	+ 3.7	170	+ 5	1.36	38.8	— 8.8	46.8	1.07
88.....	13	M	61¼	90½	— 9.0	148	— 6	1.36	44.8	+12.0	61.0	1.50
437.....	13	M	63½	114	+ 4.5	163	+ 6	1.53	37.7	— 6.4	57.8	1.12
270.....	13	F	65	110	— 9.0	160	— 2	1.54	32.4	+11.6	50.0	1.00
99.....	13	F	66¾	122½	— 3.5	171	+ 5	1.64	25.9	—19.9	42.5	0.76
327.....	14	M	68	130½	— 2.6	137	—11	1.70	43.4	+ 8.0	73.8	2.39
266.....	14	M	68¼	127¾	— 5.1	165	+ 6	1.69	36.4	— 8.7	61.6	1.07
50.....	14	F	65¾	115	— 5.7	150	— 8	1.58	41.6	+24.6	65.7	1.26
51.....	14	F	62½	127¼	+15.1	170	+ 4	1.58	31.0	— 8.0	49.1	0.85
184a.....	15	M	64¼	115½	— 2.0	148	— 4	1.55	46.2	+15.3	71.7	1.37
132.....	15	M	66	159	+27.2	169	+ 8	1.82	30.0	—27.0	54.3	0.75
47.....	15	F	65½	116	— 4.9	150	— 8	1.58	38.2	+12.6	60.5	1.15
563B.....	15	F	68½	155½	+14.0	167	+ 2	1.83	31.7	—19.0	58.1	0.82

Correlations were found between percentage deviation from average calories per kilogram of body weight per hour and from average width-length index for age and sex as follows:

177 boys	ages 3-17 years	equals	—0.196 : ±0.049
238 girls	ages 31-7 years	equals	—0.262 : ±0.041

These negative correlations show that degrees of slenderness below average of body build are related to degrees of increase above average in oxygen absorption in the whole series of children as well as in the selected group presented in table 1. The correlation is higher for girls than for boys.

TABLE 2.—*Oxygen Consumption by Age and Sex from Nine Hundred and Thirty-Two Basal Metabolic Rate Determinations*

Age, Years	Number Boys	Total Calories per Hr.	Average Calories per Hr.	Total Calories per Kg. per Hr.	Average Calories per Kg. per Hr.	Number Girls	Total Calories per Hr.	Average Calories per Hr.	Total Calories per Kg. per Hr.	Average Calories per Kg. per Hr.
3	3	106.7	35.6	5.24	1.75	5	138.8	27.8	9.37	1.87
4	14	575.7	41.2	29.59	2.11	10	355.5	35.6	19.26	1.93
5	14	571.0	40.8	28.94	2.07	27	1,028.8	38.1	49.12	1.78
6	43	1,780.4	41.4	83.74	1.95	60	2,414.9	40.2	101.33	1.69
7	39	1,658.6	42.5	69.62	1.76	42	1,730.8	41.2	68.82	1.64
8	44	2,089.8	47.5	76.77	1.74	60	2,628.0	43.8	96.18	1.60
9	40	1,928.3	48.2	62.62	1.57	54	2,506.4	46.4	81.65	1.51
10	28	1,374.0	49.1	42.16	1.50	54	2,605.8	48.3	75.45	1.40
11	33	1,760.9	53.3	52.03	1.57	57	2,925.6	51.3	73.92	1.30
12	47	2,486.0	52.7	62.29	1.32	32	1,671.2	52.2	40.10	1.25
13	48	2,630.7	54.8	62.63	1.30	31	1,678.0	54.1	35.23	1.14
14	29	1,702.8	58.7	36.80	1.27	28	1,609.1	57.5	30.45	1.09
15	12	789.4	65.8	14.31	1.19	24	1,337.3	55.7	24.41	1.02
16	13	796.9	61.3	14.96	1.15	14	804.4	57.5	14.27	1.02
17	10	710.9	71.1	11.45	1.15	9	498.7	55.4	9.84	1.09
18	1	65.6	65.5	1.05	1.05	7	377.4	53.9	7.30	1.04

TABLE 3.—*Width-Length Index of Body Build Showing Average Indexes by Age and Sex* *

Age	Male	Female	Age	Male	Female
0-1	173	175	9	158	159
1	168	172	10	158	160
2	167	171	11	157	161
3	166	166	12	157	162
4	162	163	13	156	163
5	161	161	14	155	163
6	159	159	15	155	164
7	158	159	16	154	164
8	158	159			

* Based on 4,000 children.

The difference in relative width of the body (measured by the width-length index) seems to be a determining factor in oxygen absorption both in total amount and on the per unit basis.

When oxygen absorption is reduced to a unit basis by recording calories of heat production per kilogram of body weight per hour, or per square meter of body surface per hour, it is seen that slender-built children have a higher per unit basal oxygen requirement than the broad-built ones. This is the constitutional or inherited body build factor in the basal metabolism of children.

Flemming [3] reported that markedly underweight children have high basal metabolic rates. His high rates were found in children who were as much as 35 per cent underweight; but as in our series such children are invariably slender-built with width-length indexes much smaller than average, their relative nutrition is not so poor as the percentage deviation from average weight would indicate. Consequently, the high basal metabolic rates cannot be explained purely on the basis of these various degrees of undernutrition. No definite relationship has been found between degrees of underweight and percentage increase in metabolism in the studies of Katherine Blunt in 1921,[4] Wang in 1926,[5] or Topper and Mulier in 1929.[6]

In our series, the large differences in oxygen requirement are not determined by great nutritional variations, since very few of our children are outside the recognized limits of normal variation in weight when their body builds are taken into consideration.

The public health authorities have established 10 per cent overweight and 7 per cent underweight as the upper and lower limits of normal variation from the height-weight-age table averages, and they report overweight and underweight only as outside these limits. When proper allowance is made for relative breadth of body, or body build, the children in table 1 are, with very few exceptions, within the defined limits. It is obvious that a child whose body is broader than average should weigh more than average and a child whose body is narrower than average should weigh less than average. We have followed the method reported elsewhere in allowing the percentage deviation from average weight to depend on the percentage deviation from the average index of body build, for age and sex. Thus the child in case 139 whose weight is 35 per cent more than the average assigned on the height-weight-age table has an index of 180, which is 14 per cent broader than the average 10 year old boy. He is then allowed 14 per cent more than average weight because of his body build and is therefore found to be 21 per cent overweight.

The child in case 381A is reported 17.2 per cent underweight, but his index of body build is 142, or 10 per cent less than the average 7 year old boy, and so he is allowed 10 per cent less than average weight for a 7 year old boy and is therefore 7.2 per cent below normal weight for his bony framework.

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3. Flemming, G. B., and Hutchinson, H. S.: A Study of Metabolism in the Undernourished Infant, Quart. J. Med. **14**:171, 1921.

4. Blunt, Katherine; Nelson, A., and Oleson, H. C.: The Basal Metabolism of Underweight Children, J. Biol. Chem. **49**:247, 1921.

5. Wang, Chi Che, and Hays, B.: Metabolism of Undernourished Children, Am. J. Dis. Child. **32**:350 (Sept.) 1926.

6. Topper, A., and Mulier, H.: Basal Metabolism of Children of Abnormal Weight: Underweight Children, Am. J. Child. Dis. **38**:299 (Aug.) 1929.

Benedict and Talbot have shown that surface area is a better unit of reference for predicting basal metabolic rate than age, height or weight. An "almost uncanny agreement" is reported by duBois to be found in applying surface area formulas to basal metabolism of subjects with widely different body form. We believe that surface area measurements show up the same differences in persons that our width-length index of body build does. The broad person has greater weight and greater surface area than the slender-built person of the same age, sex and height. The slender-built person has greater surface area per pound of body weight than the broad-build one.

TABLE 4.—*Average Surface Areas for Three Hundred and Fifty-Five Children by Age and Sex*

Male			Female		
Age, Yrs.	No.	Average Surface Area, Sq. Meters	Age, Yrs.	No.	Average Surface Area, Sq. Meters
3	..	.....	3	2	0.890
4	4	0.845	4	2	0.848
5	2	0.860	5	4	0.850
6	13	0.840	6	22	0.910
7	22	0.890	7	15	0.990
8	15	0.975	8	34	0.970
9	14	1.080	9	23	1.100
10	16	1.195	10	26	1.160
11	14	1.280	11	21	1.270
12	20	1.275	12	15	1.315
13	8	1.360	13	12	1.480
14	9	1.440	14	12	1.600
15	5	1.705	15	9	1.590
16	4	1.510	16	6	1.610
17	1	1.640	17	3	1.650
18	..	.....	18	2	.....

We have estimated the surface areas for one series of 355 children from the duBois body surface chart and found the averages for the various age-sex groups (table 4). We compared percentage deviations from the surface area averages with the percentage deviation from the width-length index and found that the deviations run parallel, and that deviations from surface area are in the same direction and correspond in sign to deviations from index. The correlation is as follows:

157 boys ages 3-17 σx 4.9 σy 3.3 equals $+0.178 \pm 0.036$
187 girls ages 3-17 σx 5.1 σy 3.4 equals $+0.319 \pm 0.044$

The correlation is positive and is higher for girls than for boys.

Weight affects body surface more than height in this series (note cases 93 and 466 in which weight is the same and height is different, and cases 290A and 139 in which height is the same and weight different).

We feel that the constitutional or hereditary factor of body build is causative in these findings and that the simple determination of the body build index is an adequate measure of this hereditary factor of build.

It appears that the type of bony framework possessed by a child is as unalterable a hereditary characteristic as the color of his eyes and the shape of his nose. Growth changes modify the proportions from babyhood through childhood to adolescence, but the baby whose bony framework is small and more slender than the average baby will be small boned and more slender than the average for his age-sex group all his life. However, his nutrition may fluctuate widely, so that the soft tissue padding may change its relative proportions very greatly at different periods of life.

Explanation of the body build factor in basal metabolic rates may be found in Dr. Stockard's work. The clinical picture of these slender children with high basal metabolic rates, rapid pulse rates, fatigability and restless or nervous tendencies seems to be adequately explained by his experimental work. In his article "Human Types and Growth Reactions," in the *American Journal of Anatomy*,[7] he stated:

> The two groups into which almost all ordinary persons fall more or less exactly may, therefore, be termed the Linear Type and the Lateral Type. The linear type is the faster growing high metabolizing thin but not necessarily tall group, while the lateral type is slower in maturing and is stocky and rounder in form. Initial growth and rapid growth tend to produce linear structure. In all plants and animals there is this primary tendency to form an axis or line of growth. Following this, lateral growth in width takes place. Crudely stated there is a tendency first to attain length and later width. Secondly there is a certain degree of competition between these two tendencies so that as a rule the growth in width only expresses itself after the length growth has worn itself down and become slower.
>
> It follows that any organ capable of affecting the rate of metabolism or oxidation would necessarily affect the rate of growth and must likewise affect the form and structure of the individual. The one organ in the vertebrate body which seems above all others to affect the rate of metabolism is the thyroid gland and we actually know from convincing experimental proof that this gland also greatly affects the rate of growth and structural development. It is a fact that the cretin without a thyroid gland is incapable of growth and development. The tadpole without thyroid does not metamorphose into a frog. The thyroid is essential for growth from babyhood to maturity. Very probably the thyroid is not alone in its action; it may be affected by many other things and so may growth rate, but the point of primary importance is that the thyroid is the central body tending to control the rate of oxidation and, therefore, growth rate in the individual. An active thyroid gives fast growing, rapidly differentiating structures and linear rather than large lateral type individuals.

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7. Stockard, C. R.: Human Types and Growth Reactions, Am. J. Anat. **31**: 261, 1923.

One premise we may depend upon, namely, that all structural form in animals results from processes of unequal growth. Equal growth in all directions from the original spherical egg would result in a sphere. Spheres may differ in size but in form all are alike. Should the growth processes be exactly the same in two specimens their final structures will also be exactly alike. Whenever the growth processes of the two differ, the resemblance is modified. Thus the problem of human types is a problem of growth and all individuals that may be grouped together under one type are individuals with closely similar growth histories. Certainly from the time of birth numerous growth affecting substances are being produced in the body and the action of these stuffs regulates and modifies the rate and type of growth. Their usual effects are simply to increase or decrease the rate of metabolism and to cause the individual to grow faster or slower than another, thus giving rise to the variations above and below the mean.

There is a great bulk of evidence . . . to show that the amount or quality of thyroid secretion present in the developing individual is an enormously important element in determining the rate of its growth. The thyroid affects the growth rate by primarily determining or affecting the rate of metabolism.

CONCLUSIONS

1. Slender-built children normally have higher basal metabolic rates than broad-built children of the same age-sex group.

2. The difference in relative width of the body (measured by the width-length index) seems to be a determining factor in oxygen absorption both in total amount and on a per unit basis.

3. High basal rates are characteristic of linear type children. Differences in oxygen requirement are not determined by nutritional variations in children.

4. Significant correlations are presented between basal metabolic rate and weight-length index and also between calories per kilogram of body weight per hour and weight-length index.

5. Slender-built children use more oxygen per unit of weight than broad-built children of the same age-sex group.

6. Slender-built children use more oxygen per unit of body surface than broad-built children of the same age-sex group.

7. Surface area measurements apparently show up the same differences in persons that our width-length index of body build does.

8. We feel that the constitutional or hereditary factor of body build is causative in these findings, and that the single determination of the body build index is an adequate measure of this hereditary factor of build.

BLOOD PRESSURE IN THE NEW-BORN

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The study of arterial blood pressure in the new-born has been carried out by many investigators. Most of the results have been observed in only a few subjects, as part of a more extensive study in older children. Von Basch,[1] a pioneer in this field, worked with an apparatus which now seems crude, namely, a padded button exerting a measured pressure on the radial artery. Systolic pressure was determined by observing pulsations at the wrist. Following him came Neu,[2] Trumpp,[3] Oppenheimer and Bauchwitz,[4] Gundobin,[5] Popoff,[6] Ssladkoff [7] and Seitz and Becker.[8]

Paul Balard [9] made an extensive study of the blood pressure in the new-born and published several articles on the subject. He did this work with a Pachon oscillometer, the common blood pressure apparatus of France. He found that the average systolic pressure of forty new-born infants was 55 mm. of mercury, and the diastolic was 35 mm. Infants delivered by the use of forceps gave slightly higher readings for the systolic phase. Reis and Chaloupka [10] studied the systolic pressure in one hundred infants from several interesting points of view, comparing especially the relations of pressure and type of delivery. Another thorough study was made by Rucker and Connell.[11] Wolff [12]

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6. Popoff, A. M.: Vrach, March, 1914.
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10. Reis, R. A., and Chaloupka, A. J.: Surg., Gynec. & Obst. **27**:206, 1923.
11. Rucker, M. P., and Connell, J. W.: Blood Pressure in the Newborn, Am. J. Dis. Child. **27**:6 (Jan.) 1924.
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recently reported results obtained by using the Tycos pocket sphygmomanometer on sixty babies, palpating the pulse at the wrist. The average systolic pressure, taken at the third to seventh days, was 60 mm. A summary of the previous literature is found in table 1.

It is evident from these reports that one cannot state a definite figure for the blood pressure of new-born infants. The observations are based on the use of different instruments, and in several cases the findings are based on a very few subjects. The ideal method would be to use the same apparatus, i. e., the mercury manometer and the 13 by 20 cm. rubber cuff, with the same technic, auscultating sounds at the elbow,

TABLE 1

Author	Method	Results
von Basch	Pressure on radial artery with button, noting disappearance of pulse	?
Neu	Gärtner tonometer	Normal new-born, 90 mm. systolic
Trumpp	Gärtner tonometer	60–90
Oppenheimer and Bauchwitz	Riva-Rocci sphygmomanometer	60–80
Gundobin	Riva-Rocci sphygmomanometer	60–80
Popoff	Riva-Rocci sphygmomanometer	40–70
Ssladkoff	Gärtner tonometer	First day, 59-64 systolic, gradually increasing to 79-80 on eighth day
Seitz and Becker	?	First day, 43 systolic; seventh day, 60; fourteenth day, 70
Balard	Pachon oscillometer	First day, 55 systolic; 35 diastolic
Reis and Chaloupka	Mercury manometer palpating radial pulse	First day, 43 systolic in spontaneous deliveries; 78 systolic on tenth day varying directly with weight
Rucker and Connell	Observing oscillations of Tycos sphygmomanometer	Mean systolic, 55; mean diastolic, 40
Wolff	Tycos sphygmomanometer palpating radial pulse	Third to seventh day, 60

which is a universal method in this country for determining arterial tension. Thus one could compare results in infants directly with those in older subjects. Such a procedure is impossible for several reasons. First, the cuff described obviously cannot be applied to the infant. Second, it is extremely difficult to auscultate differences in sound produced by varying pressures in the artery at the elbow. Even palpating the pulse beats at the wrist of the new-born, as has been accomplished by some of the writers mentioned, is an extremely difficult task, indeed, often impossible. It remains, then, to establish a method and apparatus which will accurately determine blood pressure readings in all new-born infants.

The following data were obtained by the use of the Pachon oscillometer. The cuff, 5 by 20 cm., and made of light rubber, was placed about the right leg of the subject. This instrument was selected as being the most suitable for the problem at hand, for it permits one not

only to study pulsations in the artery at the point at which the compression is made, but it will accurately record feeble variations in pressure, as well as changes in the rate and rhythm of arterial pulse waves. The dimensions of the cuff given were used because they produced the largest cuff which could be conveniently fitted. The leg was selected as the site of application because, owing to the manner in which our infants are clothed, it is the most available place and consequently can be approached with least disturbance to the child. This is important, since the slightest movement of the member bearing the cuff, such as occurs in removing a shirt sleeve, makes it impossible to take a reading at that moment. Before it was decided to use the leg, however, blood pressure readings made with the cuff placed here were checked against those made with the cuff placed around the arm, with the following average difference: arm, 67 systolic, 50 diastolic; leg, 64 systolic, 44 diastolic.

The Pachon instrument enables one to estimate blood pressure by observing oscillations of a needle comparable to the pulsations of the column of mercury in the common sphygmomanometer.

For the purpose of explaining its mechanics, this instrument may be divided into two pneumatic systems. One is connected to a sensitive needle which oscillates according to the beat of the pulse against the rubber arm cuff, making a wide movement with systolic pressure and a narrow one with diastolic pressure. The other system includes a simple anaeroid manometer which records the pressure in the cuff in millimeters of mercury. By a simple device these systems can be made to record separately.

Observations of blood pressure were made during the first four days of life, after feedings, at the same relative time of day. This time was chosen because it usually found the babies quiet and least disturbed by the placing of the cuff about the leg. Even with these precautions, in many instances the infants would move and kick, particularly when the pressure in the cuff was elevated, and the procedure would be interrupted.

Examinations were made on one hundred infants. The average blood pressure readings are found in table 2:

TABLE 2.—*Average Blood Pressure Readings in One Hundred New-Born Infants*

	First Day	Second Day	Third Day	Fourth Day
Systolic	55	60	60	62
Diastolic	38	41	42	44

The daily increase in systolic and diastolic pressures is interesting. In the few prematurely born infants studied, it was noted that the babies that did not live failed to show a regular daily increase.

A study of the relation of weight at birth and blood pressure agrees with the observations of nearly every worker in this field. In general, the systolic pressure varies directly with the weight, while there is little change in the diastolic pressure (table 3). The greater differences in this weight-blood pressure ratio were in the groups of those weighing from 2 to 3, from 3 to 4 and from 4 to 5 pounds.

Balard, also Reis and Chaloupka, have noted higher blood pressure in babies delivered by forceps and other instrumental methods than in

TABLE 3.—*Blood Pressure—Weight Relations. Readings Made at Fourth Day of Life; Average Weight in One Hundred Cases, 6 Pounds, 15 Ounces*

Weight Group	Number of Cases	Blood Pressure, Mm. of Mercury
2 to 3 pounds	2	45/29
3 to 4 pounds	2	46/31
4 to 5 pounds	4	58/44
5 to 6 pounds	9	58/42
6 to 7 pounds	33	62/44
7 to 8 pounds	32	62/44
8 to 9 pounds	13	61/41
9 to 10 pounds	3	63/43
10 to 12 pounds	2	65/44

TABLE 4.—*Relation of Arterial Tension and Type of Delivery in 7 to 8 Pound Group*

Type of Delivery	No. of Cases	Average Weight at Birth	First Day	Second Day	Third Day	Fourth Day
Spontaneous	15	7 lb., 9 oz.	57/40	61/46	60/42	62/47
Instrumental	15	7 lb., 7 oz.	54/34	60/40	61/42	63/43

TABLE 5.—*Relation of Pressure Before and After Spinal Drainage in Four Cases of Cerebral Hemorrhage*

	Case 1	Case 2	Case 3	Case 4
Before withdrawal	58/38	70/50	62/35	56/38
One-half hour after withdrawal	42/ ?	63/42	62/30	50/34

those born spontaneously. In the series now reported, of thirty babies in the 7 to 8 pound group, fifteen were delivered with forceps or version, and fifteen were born spontaneously. Table 4 reveals that the average blood pressure of the former group is generally not as high as that of the latter. These figures follow the arithmetical proportion previously stated, in which tension varies directly with weight, since the average weight of the group born spontaneously is 7 pounds and 9 ounces and that of the group delivered by instrument is 7 pounds and 7 ounces.

The comparison of readings made before and after cisternal or lumbar puncture was performed in four babies whose condition was diagnosed as cerebral hemorrhage is interesting. Table 5 shows that the systolic pressure taken one half hour after one of these procedures was lower in all but one instance, while the diastolic pressure was lower in all. One may interpret these differences as being due to relief from increased intracranial pressure. Further study in the relation of arterial tension and cerebral hemorrhage in the new-born may lead to a clearer understanding of this serious condition.

SUMMARY

1. The literature on arterial blood pressure in the new-born is reviewed.

2. The tension in a group of one hundred babies was recorded for the first four days of life, averaging successively 55 systolic, 38 diastolic; 60 systolic, 41 diastolic; 60 systolic, 42 diastolic, and 60 systolic, 44 diastolic. The determinations were made with the Pachon oscillometer, with a 5 by 20-cm. cuff placed about the right leg.

3. In general, the systolic blood pressure is higher in the babies of greater weight at birth, while the diastolic varies little.

4. There was little difference in the blood pressure of fifteen babies delivered instrumentally, as compared to fifteen babies of the same weight group (from 7 to 8 pounds) born spontaneously.

5. Interesting observations were noted on comparison of tension before and after drainage of spinal fluid in four infants with cerebral hemorrhage.

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NUTRITIONAL CONDITION OF NEW-BORN INFANTS

A STATISTICAL STUDY

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This study was performed to see if, in practice, there is any proof that exogenous factors during pregnancy influence the nutritional condition of the new-born infant.

Experimental studies on animals have shown that a deficient diet during gestation sometimes, but not always, influences the length and weight of the new-born young. In experiments performed on dogs,[1] it was found that a diet low in calcium, phosphorus and fat-soluble vitamins during gestation did not influence essentially the length and weight of the new-born young of the first litter. In a thorough chemical and histologic examination of these young, however, definite pathologic changes were found in the bony system, resulting in the development of severe osteoporosis and rickets, postnatally, in animals on the same deficient diet. When the mother continued to receive a deficient diet after the first period of gestation and lactation the weight and length of the puppies of the second litter were far below normal, and the clinical picture corresponded to a congenital debility. As far as weight and length are concerned, other authors have arrived at similar results.

In spite of such experimental results the general opinion has usually been that the diet and general condition of the human mother during pregnancy are of minor importance for the development of the fetus. For this reason it has usually not been considered necessary to have mothers under special observation during pregnancy, except as regards urinanalysis, and not until the mothers have shown definite pathologic symptoms have they been told to be under constant observation.

During the last five or ten years reports have been published that point to the fact that exogenous factors during pregnancy are of great importance in influencing the development of the human fetus. The Berlin gynecologist, Max Hirsch,[2] has recently collected his observations on this point. According to him, strenuous work during the latter

1. Toverud, K. U., and Toverud, G.: Studies on the Mineral Metabolism During Pregnancy and Lactation and Its Bearing on the Disposition to Rickets and Dental Caries, Acta pædiat. (supp. 2) **12**:1, 1931.

2. Hirsch, Max: Mutterschaftsfürsorge, Leipzig, Johann Ambrosius Barth, 1931.

part of pregnancy is a factor that increases the number of prematurely born infants and of infants with a low birth weight. Ferrara [3] found that the duration of the mother's rest from outside work before delivery determined to some extent the birth weight of the infant. It is also a fact, according to Schneider,[4] that the number of premature infants increased definitely in Germany during the war, when women had to replace men in all kinds of work. Peller [3] recently showed that a good condition of the mother during the latter part of pregnancy results in a better development of the new-born infant and in a diminution in the number of premature and still-born infants and of neonatal deaths.

These are just a few examples from the literature indicating that a factor connected with the social life of the mother, such as strenuous work during the latter part of pregnancy, plays an important rôle in the development of the human fetus. This, however, is not the only exogenous factor that one has to consider in this connection. It is probably also true that all factors which lower the human mother's vitality for a certain length of time also influence the vitality of the fetus, and the doctrine that the fetus is a parasite on the mother may not be fully correct.

It has been the general belief that the diet of the mother plays a minor rôle in the development of the fetus, except in cases in which gross deficiencies are present. Conclusions in this connection have often been drawn from individual cases. This leads to difficulties of interpretation, because one woman's reserve stores of material and hormonal regulation may be quite different from those of another. A sufficiently large material of a uniform character, however, may allow one to draw some conclusions on this point.

During the winter it is difficult to get fresh fruit and vegetables in Norway. Milk is also found to be rather low in vitamin content during this time of the year. Fresh fruit and vegetables in winter are usually imported and are very expensive. It is mainly in the months of July, August and September, particularly in August, that there is plenty of such food, and it is cheap and accessible to everybody.

Under such conditions, it might be of interest to see if a seasonal variation in the nutritional condition of the new-born infants could be shown, and at the same time to consider other factors that might influence the development of the fetus as far as could be ascertained from statistical material.

A similar study was performed ten years ago by Abels [5] in Vienna over a period of two years. He found an increase in birth weight

3. Quoted by Hirsch,[2] p. 74.
4. Schneider, quoted by Hirsch,[2] p. 113.
5. Abels, H.: Klin. Wchnschr. **1**:1785, 1922.

during the summer months, an increase which was more pronounced in multiparas than in primiparas.

The material for the present study was taken from a small municipal obstetric clinic of Oslo which has been running since 1920. The women delivered here constitute rather uniform material from year

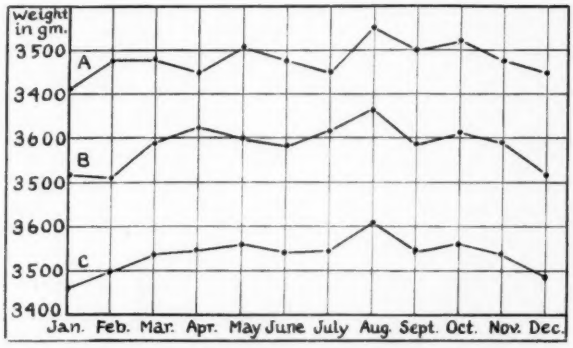

Chart 1.—Curves for the weight in grams of the legitimate group: *A*, full-term girls (2,046); *B*, full-term boys (2,205); *C*, both groups (4,251).

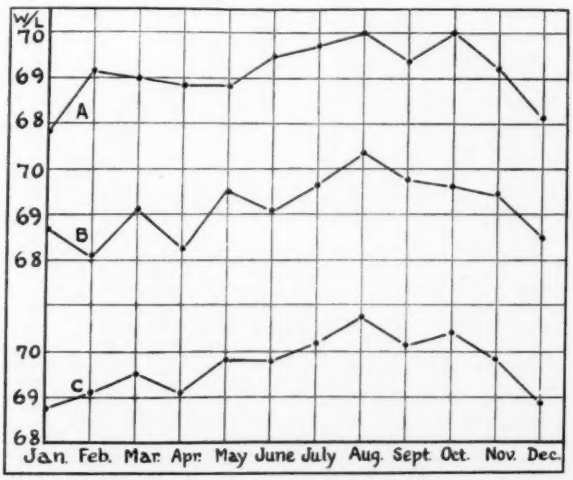

Chart 2.—Curves for the weight-length ratio of the legitimate group: *A*, full-term girls (2,046); *B*, full-term boys (2,205); *C*, both groups (4,251).

to year, as they all live in the city and belong to the middle class of the population. The material consisted of 4,954 infants, of whom 4,598 were full-term infants and 356 premature. Of the full-term infants 4,251 were legitimate (2,046 girls and 2,205 boys) and 347 illegitimate (170 girls and 177 boys).

When the nutritional condition of the new-born infant is to be considered, it is customary to take the birth weight of the infant as

a criterion. To consider the weight in relation to length might be more correct. This ratio of weight to length was calculated for each infant. The weight alone is also given for comparison with earlier statistical reports.

The mean weight and weight-length ratio are plotted for each month throughout the twelve year period, 1920 to 1931, in charts 1 and 2 for girls and boys separately and for girls and boys together.

It is evident from these curves that the highest value for weight as well as for the weight-length ratio occurs in August, and the lowest

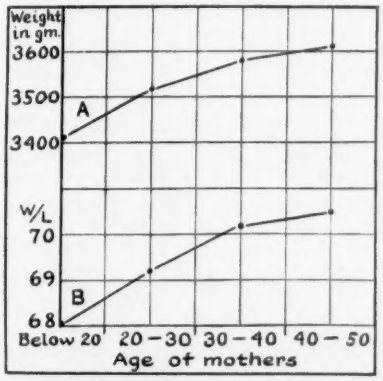

Chart 3.—Weight (*A*) and weight-length ratio (*B*) of full-term infants, according to the age of the mothers.

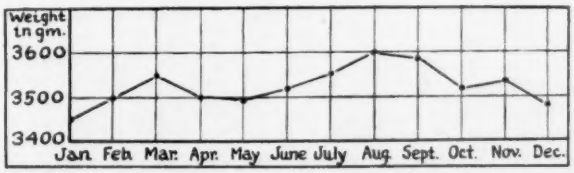

Chart 4.—Average weight of 2,614 full-term infants born to women between 20 and 30 years of age.

value in January and December. In the weight-length curve for girls, October shows the same value as August. In all other curves, August gives definitely the highest peak.

The season of the year may not be, however, the only determining factor. The age of the mother plays an important part in the weight and length of the new-born infant, possibly owing to a better storage of material in an older organism than in a younger. When the data on infants in this series are arranged according to the age of the mother, the weight and weight-length ratio are seen to increase with the age of the mother (chart 3). The possibility of a larger number

of older mothers in August, however, is not the explanation of the peak, because August does not show a higher number of older mothers than do other months of the year. Furthermore, when a curve is plotted, for the 2,614 full-term infants born of mothers in the age group of from 20 to 30 years (chart 4), the same seasonal variation appears as in the curves shown in charts 1 and 2.

Another point has also to be considered: the difference in weight and weight-length ratio between first-born and later infants. Primiparas

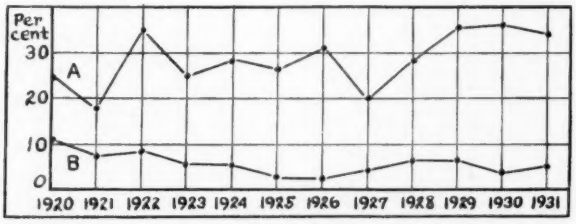

Chart 5.—Percentage of premature infants among the total number of infants born to unmarried (*A*) and married (*B*) women.

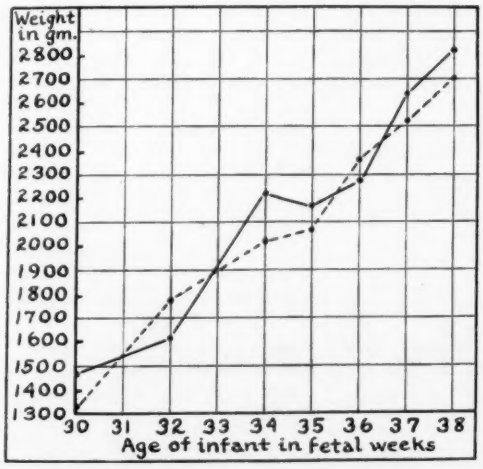

Chart 6.—Average weight of premature infants according to fetal age in weeks: solid line, legitimate infants; dotted line, illegitimate infants.

give birth to infants with a lower birth weight than multiparas do, as may be seen in table 1. This table gives the figures for legitimate infants of this series.

The higher weight and weight-length ratio recorded for the infants born in August might then simply be the result of a greater number of multiparous births. The opposite is, however, true. In this series a larger number of primiparas than multiparas gave birth to both girls and boys during August.

It is therefore probable that an exogenous factor is present in the summer months, causing the highest weight and weight-length ratio of new-born infants in August. There are several factors to be considered in this connection. One may be the increased amount of sunlight or daylight at this time of the year; another, the rest during the summer; a third, a change in the food of the mothers. Most likely all these factors operate together to produce better nutrition of the infant. When, however, one considers which of the three factors is the dominating one, May, June and July are found to have the most hours of daylight and usually also of sunlight. The actual amount of sunshine cannot be recorded, as the Meteorological Institute does not keep a record of it. If the increased daylight or sunlight had been the main factor, the peak of the curve should have appeared at least one month

TABLE 1.—*Correlation Between Birth Weight and Parity: Legitimate Infants*

	Girls		Boys	
	Weight, Gm.	Weight/Length	Weight, Gm.	Weight/Length
Primiparas	3,414	67.8	3,488	68.6
Multiparas	3,563	70.7	3,701	72.2

TABLE 2.—*Correlation Between Weight, Parity and Legitimacy*

	First-Born Girls		Later Girls		First-Born Boys		Later Boys	
	Weight, Gm.	Weight/ Length	Weight, Gm.	Weight/ Length	Weight, Gm.	Weight/ Length	Weight, Gm.	Weight/ Length
Married women	3,414	67.8	3,563	70.7	3,488	68.6	3,701	72.2
Unmarried women	3,327	66.5	3,482	69.2	3,487	68.6	3,681	71.5

earlier. As for the other factor mentioned, rest during the summer may have played a rôle in some cases. For many mothers, however, summer is in no way more restful than other times of the year. The possibility of getting more fresh food in Norway at that time, particularly fresh berries, vegetables and milk of high vitamin value, is on the other hand quite certain. As experimental work has shown, this fact may well explain the increase in the weight and weight-length ratio of new-born full-term infants during the summer, and probably be considered as the main factor in producing the peak of the curve.

There are certainly also other factors which may be of definite influence in the development of the fetus during pregnancy. In the literature cited, the social condition of the mothers has been shown to be of influence. Strenuous work was particularly considered in this connection. In the present series as well, factors caused by the difference in the social standing of the mothers had a definite influence on the nutritional development of the infants. The series consists, as

already mentioned, of both legitimate and illegitimate infants. Both weight and weight-length ratio are different in these two groups. From table 2 it may be seen that the difference is definite for full-term girls and less definite for full-term boys.

It is true that unmarried mothers are usually younger than married mothers, and this factor contributes to a lower weight for the new-born illegitimate infant. The evidence, however, that it is possible to increase the weight of the illegitimate infant of even the youngest mothers by systematic prenatal care (evidence which will be discussed further under "Comment") shows that the youth of the mother is certainly not the only factor.

Another point of great interest among the illegitimate infants is the large number of premature infants in this group. This fact is evident from chart 5. While married women show a percentage of prematurity of 5, unmarried women show a percentage of about 30 and, for the last three years, about 35. These premature infants of unmarried women are usually also below the weight of those of married women (chart 6). The premature infants are here arranged according to their fetal age. It is evident from chart 6 that, with the exception of children 32 and 36 weeks old, all illegitimate infants are below the legitimate ones in weight.

COMMENT

Evidence has been found in this study that exogenous factors acting on the mother during pregnancy have a definite influence on the nutritional development of the human fetus.

These factors may be mainly dietetic, caused by a seasonal variation in the food in a country such as Norway, where there is no free access to fresh fruit and vegetables, and where the milk has a low vitamin content, during the winter. Another factor may also be the social standing of the mother as demonstrated in the difference existing between a married and an unmarried woman's life.

The logical consequence of this fact would then be that one should be able to improve the nutritional condition of the fetus when one regulates the mother's diet to an optimum one and when one eliminates the other disturbing factors during pregnancy. In other words, by systematic prenatal care of the mother, one should be able to raise the vitality of the infant.

There is now proof that such efforts are followed by the desired results. The most definite way of demonstrating the results is to note a lowering of the number of infants prematurely born. One of the best examples of this is the result of the work of the Maternity Center Association in New York. By intensive and systematic prenatal care

of the mother, this association was able to decrease the number of premature births to one third of the figure for the rest of the population of New York in the same year.

Similar results have been secured in the city of Oslo in a home erected for unmarried expectant mothers. The mothers enter this home from six months to a few days before delivery. Some of them first enter the home after delivery and stay with their infants for six months after birth.

For the last two years these mothers have been given what is considered an optimum diet for pregnant women, based on metabolism experiments that I [1] performed three or four years ago. The diet is rich in milk, eggs, fruit and vegetables, giving a calcium intake averaging 1.8 Gm. and a phosphorus intake averaging about 2 Gm. daily. A small dose of cod liver oil is given to each mother during the dark season.

Besides the nutritional factor, to which particular attention is paid, one must consider many other factors in this connection. The women of this group often have a hard struggle for life, and may suffer in many respects both physically and mentally. When they come into the home they are cared for in every way, and are under constant supervision by an obstetrician and a pediatrician.

The result of this systematic prenatal work during the last two years in this home was an increase in the weight of the new-born infants born of mothers who had stayed two months or more in the home before delivery. These infants showed an average birth weight of 3,587 Gm. as compared with 3,347 Gm. for infants born of mothers who stayed six weeks or less in the home before delivery, and 3,240 Gm. for infants born of mothers who entered the home after delivery—all full-term infants. Besides this result, it was found that the number of premature infants decreased considerably in the first group of women. While the infants of the women who entered the home after delivery showed the same percentage of prematurity as that for the obstetric clinic (chart 5 *A*), namely 32, the infants of women who entered the home before delivery had a percentage of prematurity of only 2.

This decrease in the number of prematurely born infants is obviously of great importance. From previous work in Norway by Sunde,[6] and Schiötz and Lofthus, in Austria by Capper [7] and also in other countries, it is known that the outlook for the premature infant is not good either in the first years after birth or in later years. Mentally and physically, many of them are subnormal. Besides this fact, pre-

6. Sunde, A.: Die Prognose der Frühgeborenen und die Prophylaxe des Geburtstraumas, Acta obst. et gynec. Scandinav. **9**:477, 1930.

7. Capper, A.: The Fate and Development of the Immature and of the Premature Child, Am. J. Dis. Child. **35**:443 (March) 1928.

mature infants make the main contribution to the high neonatal death rate, which in different countries forms from 30 to 70 per cent of the total death rate for the first year. This is a common feature of the mortality statistics, not only of Norway but of nearly all countries where reports have been made. In Oslo it was, for instance, 61 per cent for 1929 and 1930 and 52 per cent for 1931; in Bonn, 54 per cent for 1930, and in Heidelberg, 55 per cent for 1929. Zurich showed for the year 1930 one of the highest figures found, 68 per cent. These are just a few characteristic examples of rates for the past few years.

It seems evident from previous experimental work as well as from recent clinical and statistical work that the only way of decreasing this high neonatal death rate is by organizing systematic prenatal work, not only from a purely obstetric point of view, but also from the points of view of nutrition and general hygiene.

SUMMARY

Exogenous factors acting on the mother during pregnancy have been found to exert a definite influence on the nutritional development of the human fetus. This has been demonstrated by a seasonal variation in the weight and weight-length ratio of the new-born infant and by a difference in the weight and weight-length ratio of legitimate and illegitimate infants. The number of premature infants among these two groups has also been found to be quite different.

The seasonal variation in the nutritional condition of the new-born infant is probably due to a seasonal variation in the food of the mothers. Furthermore, the low birth weight and the high percentage of prematurity of the illegitimate infants are due to the social status of the unmarried mother.

It has been found possible to raise the illegitimate infant's weight and weight-length ratio by systematic prenatal care of the mother from both an obstetric and a nutritional point of view.

The importance of the prenatal care for a lowering of the neonatal deaths is described.

I am indebted to Dr. H. Natvig, the chief of the Municipal Obstetric Clinic of Oslo, for the opportunity to use the material of the clinic for this study.

BASAL METABOLISM IN ASTHMA AND IN EPILEPSY

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AND
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Reports in the literature on basal metabolism in asthma and epilepsy are few, and limited for the most part to adults.

In this paper we present the results of basal metabolic tests in a group of twenty-five children with allergic asthma and in a group of twenty-five children with true epilepsy.

The children with asthma were sent to the outpatient department for basal metabolic tests.[1] The group with epilepsy was sent to the hospital wards for study,[2] and the basal metabolic tests were made before treatment with drugs or change of diet was instituted. No test was made during an acute attack of asthma or during an epileptic seizure. The tests were made when the children were apparently symptom-free.

Studies of basal metabolism in allergic asthma that have been reported are few, and are limited to adults. Zugsmith and Kahn [3] found a reduced basal metabolism in this condition, and concluded that patients with asthma suffer from suboxidation of the tissues. Novak [4] reported a normal production of heat in one case, while Simpson [5] reported similar findings in three cases. Criep and McElroy [6] found a normal or slightly high basal metabolism in six cases. Kern and Teller,[7] in the largest series reported in the literature, found that the basal metabolism tended to be subnormal in a group of seventy-five cases of asthma, fifty-five of which were allergic and twenty infectious. In this group there were thirty-five plus readings and forty minus readings. In 20 per cent of this series, a palpably enlarged thyroid gland was noted.

From the Pediatric Service of Dr. Béla Schick, Mount Sinai Hospital.

1. These children were sent to us by the courtesy of Dr. Peshkin.
2. These children were being studied by Dr. Fries and Dr. Messeloff.
3. Zugsmith, E., and Kahn, Max: Metabolism of Asthma, Arch. Int. Med. **21**:510 (April) 1918.
4. Novak, J.: Wisconsin M. J. **19**:534, 1921.
5. Simpson, W. L.: Laryngoscope **32**:768, 1922.
6. Criep, L. H., and McElroy, W. S.: Atopy; Blood Calcium and Gastric Analysis, Arch. Int. Med. **42**:865 (Dec.) 1928.
7. Kern and Teller: J. Allergy **2**:488, 1931.

We could find no reports in the literature on the basal metabolism of asthmatic children. In our group of twenty-five children with allergic asthma, all had a basal metabolic rate which was within the normal limits of plus and minus 10 per cent, but 74 per cent of the readings were minus, while only 26 per cent were plus readings, a definite tendency toward a lowered basal metabolic rate (table 1).

Studies of basal metabolism in epilepsy are somewhat more numerous than those in asthma. Kauffman [8] and Bornstein,[9] who studied basal metabolism during epileptic seizures, found, as one would expect, a great increase in the production of heat at this time. All other studies were made during the intervals between seizures: Boothby and Sandiford [10] reported 23 per cent of twenty-two cases in which the basal metabolic rate was below minus 10 per cent, while 77 per cent were within normal limits. Compared with their group of normal persons, in which 92 per cent had a normal basal metabolism and only 3.2 per cent a basal metabolism below minus 10 per cent, these figures seem to indicate a subnormal production of heat in their group of epileptic patients. In a later group of twenty-four cases of epilepsy reported by the same authors,[11] again a fairly large percentage of the patients showed a subnormal production of heat. Other investigators, among whom we may mention Arnoldi and Ferber,[12] de Crinis,[13] Nielson,[14] Bowman and Fry,[15] Lennox and Wright,[16] Castex,[17] Notkin,[18] Davis [19] and Lennox and Cobb,[20] agree that the basal metabolic rate in the condition of epilepsy tends to be subnormal between seizures; only Talbot [21] reported a normal or slightly high metabolism in his group of eleven epileptic children.

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8. Kauffman, quoted by Grafe, in Deutsche med. Wchnschr. **47**:147, 1921.
9. Bornstein: Monatschr. f. Psychiat. u. Neurol. **42**:392, 1908.
10. Boothby and Sandiford: J. Biol. Chem. **54**:783, 1922.
11. Boothby and Sandiford: Physiol. Rev. **4**:69, 1924.
12. Arnoldi and Ferber: Ztschr. f. klin. Med. **97**:208, 1923.
13. de Crinis, M.: Ztschr. f. d. ges. Neurol. & Psychiat. **99**:718, 1925.
14. Nielson, M.: M. J. & Rec. **122**:338, 1925.
15. Bowman, F. K. M., and Fry, C. C.: Basal Metabolism in Mental Disease, Arch. Neurol. & Psychiat. **14**:819 (Dec.) 1925.
16. Lennox, W. G., and Wright, L. H.: Studies in Epilepsy, Arch. Neurol. & Psychiat. **20**:764 (Oct.) 1928.
17. Castex and others: Compt. rend. Soc. de biol. **106**:392, 1931.
18. Notkin, J.: Basal Metabolic Rate in Untreated and Treated Patients with Epilepsy, Arch. Neurol. & Psychiat. **24**:1231 (Dec.) 1930.
19. Davis, T. K.: J. Nerv. & Ment. Dis. **70**:264, 1929.
20. Lennox and Cobb: Medicine **14**:63, 1928.
21. Talbot, F. B.; Hendry, M., and Moriarty, M. E.: Basal Metabolism of Children with Idiopathic Epilepsy, Am. J. Dis. Child. **28**:419 (Oct.) 1924.

In the present series of twenty-five epileptic children, there were seven plus readings and eighteen minus readings. All except two of the children had a basal metabolic rate which was, strictly speaking, within normal limits, the tendency, however, being definitely toward the lower limits of normality.

In normal children, one would expect plus rather than minus readings because of the more intensive activity of the young, growing organism. In this connection, Lusk says, "It has definitely been established that young tissue has an inherently higher metabolism than adult tissue." [22] In these two groups of children, however, the tendency was

TABLE 1.—*Data for Patients with Asthma*

Case	Sex*	Age, Years	Weight, Kg.	Height, Cm.	Sitting Height, Cm.	Pelidisi	Pulse	Total Calories	Production of Heat, Total Calories, 24 Hours, Normal Standards			
									Sitting Height	Per Cent Variation	Total Height†	Per Cent Variation
1	♀	5	26	112	61	104	76	738	744	—1	788	—6
2	♀	5	19	106	59	97	80	666	696	—5	730	—9
3	♀	5½	27	129	68	85	80	864	925	—7	956	—10
4	♀	6	18	106	59	96	80	624	696	—10	730	—15
5	♂	6	22	114	65	92	82	864	845	+2	865	0
6	♀	6	26	120	65	97	78	770	845	—9	866	—11
7	♀	6½	28	119	67	96	86	888	898	—1	857	+4
8	♀	7	21	121	66	90	86	792	861	—8	875	—9
9	♂	9	37	142	75	95	78	1,101	1,125	—2	1,187	—7
10	♀	9	48	140	74	105	88	1,059	1,095	—3		
11	♂	9	25	129	70	89	78	912	980	—7	1,035	—12
12	♀	10	28	134	72	89	80	1,025	1,037	—1	1,005	+3
13	♀	10	41	132	70	106	82	970	980	—1	985	—2
14	♂	10½	30	127	71	94	80	936	1,008	—7	1,015	—8
15	♂	11	43	154	83	91	82	1,300	1,378	—6		
16	♂	12	40	154	83	89	88	1,400	1,378	+2		
17	♂	12	50	159	82	97	82	1,364	1,345	+1		
18‡	♀	12	54	153	81	100	80	1,296	1,312	—1		
19	♀	12	54	154	78	104	82	1,290	1,217	+6		
20	♀	13	81	157	85	110	70	1,344	1,445	—7		
21	♀	13	60	158	84	100	78	1,497	1,411	+6		
22	♀	13½	74	167	90	100	78	1,550	1,620	—4		
23‡	♀	13½	56	160	86	96	70	1,382	1,479	—7		
24	♀	14	43	153	82	92	78	1,328	1,345	—1		
25	♀	15	65	157	89	97	72	1,640	1,584	+4		

* In this column, ♂ signifies male; ♀, female.
† No figures are available beyond 150 cm. for boys and 138 cm. for girls.
‡ Thyroid enlargement.

definitely toward a lowered production of heat, and we tried to think of the factors which might be held responsible for the reduced metabolism.

We had to consider the factor of undernutrition, in which condition, as DuBois [23] said, ". . . the most important phenomenon is the striking reduction in the metabolism." We could, however, exclude this factor, as the children were, on the whole, fairly well nourished, judging

22. Lusk: The Science of Nutrition, Philadelphia, W. B. Saunders Company, 1928, p. 562.

23. DuBois, E.: Basal Metabolism in Health and Disease, Philadelphia, Lea & Febiger, 1927, p. 207.

by their pelidisi (column 6 in the tables). We used the Pirquet pelidisi [24] as an index of the nutritional state. Benedict [25] considered that the Pirquet pelidisi had a great advantage over the ordinary clinical indications as an index of the state of nutrition in children.

We could eliminate the depressant action of drugs or of a reduced intake of food. As was mentioned earlier, all the tests in the epileptic group were made before any change in diet or any therapy with drugs had been instituted. In the asthmatic group, all the tests were made in the outpatient clinic at times when the children were symptom-free and

TABLE 2.—*Data for Patients with Epilepsy*

									Production of Heat, Total Calories, 24 Hours, Normal Standards			
										Per Cent		Per Cent
Case	Sex*	Age, Years	Weight, Kg.	Height, Cm.	Sitting Height, Cm.	Pelidisi	Pulse	Total Calories	Sitting Height	Variation	Total Height†	Variation
1	♂	5	14	95	59	88	74	720	696	+4	745	−3
2	♂	5	20	101	61	96	70	720	744	−3	785	−8
3	♂	5	16	88	57	95	70	625	650	−4	685	−9
4	♀	6½	18	104	58	97	80	630	673	−6	711	−11
5	♂	7	21	112	64	93	80	746	819	−9	850	−12
6	♀	7	22	121	65	97	82	779	845	−8	875	−11
7	♂	7	26	120	68	94	80	880	925	−5	935	−6
8	♂	8	27	126	68	95	80	984	925	+6	925	+6
9	♂	8	27	120	66	97	82	800	861	−7	935	−14
10	♂	8	26	130	72	89	78	987	1,037	−5	1,045	−6
11	♀	8	44	140	75	101	90	1,248	1,125	+11	1,165	+7
12	♂	9	26	123	68	94	78	913	925	−1	965	−6
13	♂	9	26	130	71	89	78	918	1,008	−9	1,045	−12
14	♀	9	43	140	73	103	88	1,020	1,066	−4		
15	♀	9½	32	130	70	98	96	1,100	980	+12	965	+14
16	♀	9½	28	131	70	94	86	1,000	980	+2	975	+3
17	♀	10	28	130	68	96	78	877	925	−5	965	−9
18	♀	10	28	130	73	89	78	1,039	1,066	−3	1,047	−1
19	♂	10	36	136	73	97	80	1,054	1,066	−1	1,115	−5
20	♀	10½	39	143	74	98	80	984	1,095	−10		
21	♂	11	31	141	75	90	82	1,200	1,125	+7	1,175	+2
22	♀	12	39	152	78	93	88	1,176	1,217	−3		
23	♀	12	35	145	75	94	82	1,143	1,125	+2		
24	♂	13	50	150	80	101	78	1,156	1,280	−10	1,280	−10
25	♀	14	43	153	82	92	80	1,328	1,345	−1		

* In this column, ♂ signifies male; ♀, female.
† No figures are available beyond 150 cm. for boys and 138 cm. for girls.

following their usual daily routine and their accustomed dietary regimen and receiving no medication.

The endocrine glands have been blamed for the subnormal production of heat in epilepsy and asthma. We therefore considered the factor of impaired function of the thyroid glands. There were only two children (cases 18 and 23, table 1) with an enlarged thyroid gland, but there were no other stigmas of dysfunction of the thyroid gland in these two children or in any of the others, so that we were able to eliminate

24. Pirquet, C.: An Outline of the Pirquet System of Nutrition, Philadelphia, W. B. Saunders Company, 1922.

25. Shattuck and Benedict: Am. J. Physiol. **96**:524, 1931.

enlargement of this gland as a causal factor in the lowered production of heat.

Obesity on an endocrine basis is said to cause a lowered basal metabolism. There were only eight obese children in this series (cases 1, 10, 13, 19 and 20, in table 1, and cases 11, 14 and 24, in table 2), and the obesity was of a nutritional rather than an endocrine basis.

Davis seems to think that the lowered readings in epilepsy might throw some light on the physiologic rôle of the pituitary gland in this condition. Lennox and Cobb had the same explanation for some of their cases, while in others they thought that poor musculature might explain the reduced basal metabolic rates. Kern and Teller postulated a subnormal suprarenal or thyroid function, but in either case they conclude that the reduced production of heat is an effect rather than a cause.

Certainly therapy for disorders of the pituitary, suprarenal and thyroid gland seems not to have been of any value in the treatment of either epilepsy or asthma.

We believe that the lowering of the basal metabolic rate in epilepsy and in asthma can be explained on a different basis. One must remember that the normal level of the basal metabolic rate remains fairly constant under the stimulus of thyroxine, which is a catalytic agent in all oxidative processes. Normally, there are from 12 to 14 mg. of thyroxine in the tissues, and this amount varies within very narrow limits. A shift of 1 mg. causes a corresponding shift of 2.8 per cent in the basal metabolic rate. The amount of thyroxine in the tissues may be below normal as a result of temporary or permanent disability of the thyroid gland, or of physical conditions in which the gland is not stimulated to deliver sufficient thyroxine to maintain the normal amount in the body, as happens, for example, in extreme malnutrition. Or it is possible that periods of sustained stress may exhaust thyroxine more rapidly than it can be produced. Such periods of sustained stress may occur as a result of infection and may account for the lowered basal metabolism frequently found in the postinfectious stages of certain diseases, notably pneumonia.[26] It is conceivable that the spasmodic upheavals attendant on frequent epileptic seizures and asthmatic attacks may constitute such periods of sustained stress, leaving a somewhat reduced supply of thyroxine in the tissues, with a correspondingly lowered basal metabolic rate. The reduction of metabolism should not necessarily be considered an indication for the use of thyroid therapy.

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26. Schick, B., and Cohen, P.: Lowered Basal Metabolism in Postinfectious Stages and in Diseases Characterized by Slow Pulse Rate; Preliminary Report, Am. J. Dis. Child. **30**:291 (Sept.) 1925.

SUMMARY AND CONCLUSIONS

The results of basal metabolic tests on twenty-five children with asthma and on twenty-five children with epilepsy are here reported

Of the twenty-five cases of asthma, all showed a basal metabolic rate which was within normal limits; the majority, however, were minus readings.

Of the twenty-five children with epilepsy, twenty-four had a normal basal metabolic rate; the majority again showed minus readings.

The basal metabolism of these children suffering from epilepsy or from asthma evidently tends to be lowered. The lowered rate of metabolism should not be considered an indication for the use of thyroid. It may perhaps be explained on the basis of a reduced amount of thyroxine in the tissues due to excessive demands made on the thyroid gland during the spasmodic upheavals which occur periodically in these two conditions, and therefore is an effect rather than a cause of epilepsy and asthma.

RESOLVING EXUDATES IN PULMONARY TUBERCULOSIS OF CHILDHOOD

STUDY II

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In the first part of this work [1] the pathologic character of the resolving exudates in pulmonary tuberculosis of children was discussed. In the present paper are presented principally clinical and roentgenologic records in support of the ideas developed in study I and as further evidence [2] from this clinic, first, that extensive exudates in the pulmonary tuberculosis of children do resolve completely, and, second, that it is impossible to differentiate from the mode of onset and the physical signs whether a given lesion will result in complete recovery or an extension of the disease process and death.

Observations have been made at the Babies and Childrens Hospital of Cleveland on one hundred and ninety tuberculous children during a period of six years. The time of observation varied from five months to three years. Roentgenograms were taken frequently, often every two weeks. In this way the development of pulmonary lesions from their first manifestations through the acme to complete healing could be observed. The chief criterion for the diagnosis of a resolving exudate was the complete resolution of an extensive homogeneous pulmonary exudate. The roentgenograms were chiefly depended on in the study of these lesions. Shadows which could with reason be interpreted as hilar nodes or as exudates in the various parts of the pleural or the mediastinal spaces were rejected. No case was accepted which showed signs of pulmonary collapse. All cases, of course, showed sensitivity of the skin to tuberculin.

The following cases are illustrative of the kind of material presented by the one hundred and ninety patients studied in forming the basis of this report.

From the Babies and Childrens Hospital and the Department of Pediatrics, School of Medicine, Western Reserve University.

1. Reichle, H. S.: Resolving Exudates in Pulmonary Tuberculosis of Childhood: Study I, Am. J. Dis. Child. **45**:307 (Feb.) 1933.

2. Gerstenberger, H. J., and Burhans, C. W.: Treatment of Extensive Pulmonary Tuberculosis with Ultraviolet Rays, Am. J. Dis. Child. **33**:54 (Jan.) 1927.

REPORT OF CASES

CASE 1.—*History.*—J. V., a white girl, aged 12 months, was admitted to the hospital on Sept. 9, 1926. For the first five months the infant had been in contact with the father, who suffered from open pulmonary tuberculosis. The reaction to tuberculin was known to have been positive in May, 1926. The only symptom was loss of weight for two weeks. On admission, the weight was 6.8 Kg., and the reaction to tuberculin (intracutaneous) was positive for a dilution of 1:10,000. The percussion note was impaired over the right upper anterior and right upper posterior portions of the thorax, and there were bronchial breath sounds and an increased voice fremitus over these areas.

Course.—For ten days there was a continuous fever up to 40 C. (104 F.). The temperature then returned to normal. Occasionally a peak to 38.5 C. (101.3 F.) was observed, until in November, 1926, when a second period of high fever set in which was sustained at about 40 C. (104 F.) for ten days. During the early weeks of her stay in the hospital the child suffered from anorexia, dyspnea, extreme lassitude, cyanosis and loss of weight. Small and large râles were heard over the bases of both lungs.

Reexamination.—On Oct. 1, 1929, the weight was 15.1 Kg. The child was in an excellent state of nutrition. There were no symptoms, and physical examination gave negative results. The reaction to tuberculin (intracutaneous), in a dilution of 1:1,000, was 2 plus.

Roentgenograms.—Sept. 4, 1926: There was a globular shadow adjacent to the mediastinum in the right upper pulmonary field. Proceeding from the right hilus there were linear shadows which passed down to the dome of the right side of the diaphragm.

Sept. 18, 1926: The right upper pulmonary field was clear; the mediastinal shadow was wide, and in the right lower pulmonary field a few linear shadows remained.

Oct. 13, 1926: A small circular shadow was seen at the right hilus. A brush-like shadow passed down toward the diaphragm, where it merged with another irregularly shaped shadow.

Nov. 24, 1926: A new advance into the right upper pulmonary field had appeared.

Jan. 28, 1927: There had been a return to the picture of Oct. 13, 1926.

Oct. 1, 1929: A linear shadow was present at the position of the right major interlobar fissure, and there was a dense, irregularly shaped shadow above the dome of the diaphragm, probably an area of calcification. All diffuse pathologic conditions had disappeared.

In this child, who was infected during the first six months of life, an infiltration of the right upper lobe developed; she was extremely ill, had a high fever and showed not only dulness on percussion, but also the auscultatory phenomena of bronchial breath sounds and râles. The process was repeated, apparently without any external motivation, about two months later. The resolution occurred rapidly and at the time of discharge from the hospital was complete; nothing remained but a calcified area in the lower part of the right lung and an increase in the width of the mediastinal shadow. In this case the suggestion might

be made that the infiltration was due to a nontuberculous pneumonia. In the previous paper I stated that the differential diagnosis between pneumonia caused by the tubercle bacillus and that due to other organisms, such as the pneumococcus, might be difficult in certain cases. In this case, however, the reaction to a high dilution of tuberculin, the recurrence of the exudate and the evidence of mediastinal disease on the same side are points in favor of a tuberculous etiology.

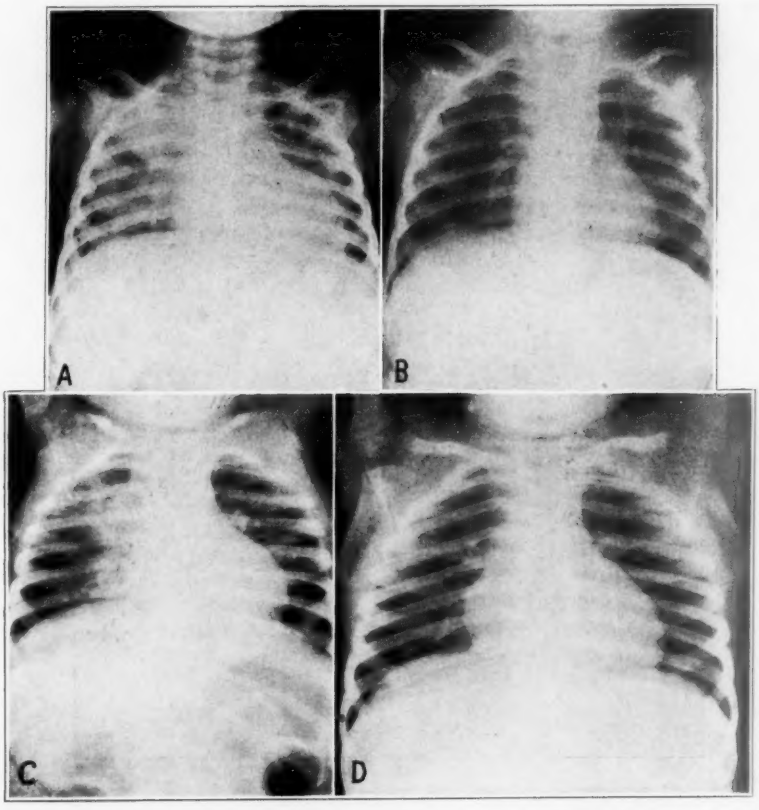

Fig. 1 (case 1).—Roentgenograms taken on: *A*, Sept. 4, 1926; *B*, Oct. 13, 1926; *C*, Nov. 24, 1926; *D*, Oct. 1, 1929.

CASE 2.—*History.*—M. J., a colored girl, aged 10, was admitted to the hospital on May 25, 1928. Five years previous to this date the child had been in contact with the landlady, who had pulmonary tuberculosis. "Grip" followed this contact. She had been ill for six months, and had had a cough and a temperature of 38 C. (100.4 F.).

On May 3, 1928, the patient attended a public dispensary, where dulness on percussion, râles and bronchial breath sounds of decreased intensity were found over the left upper posterior part of the chest. The reaction to the tuberculin test (1:1,000) was positive.

On admission, a history was obtained of loss of weight, anorexia, night sweats and a cough. All these symptoms had appeared six weeks previous to admission; the cough was unproductive, but had been increasing in severity.

The temperature was 38.5 C. (101.3 F.); the weight, 31.8 Kg. There was general lymphadenopathy; the epitrochlears and the right parathoracic nodes were palpable. The spleen could not be felt, but the liver was 2 fingerbreadths below the right costal margin. The left side of the chest was smaller than the right and lagged behind the right in respiratory motion. Posteriorly, both upper pulmonary

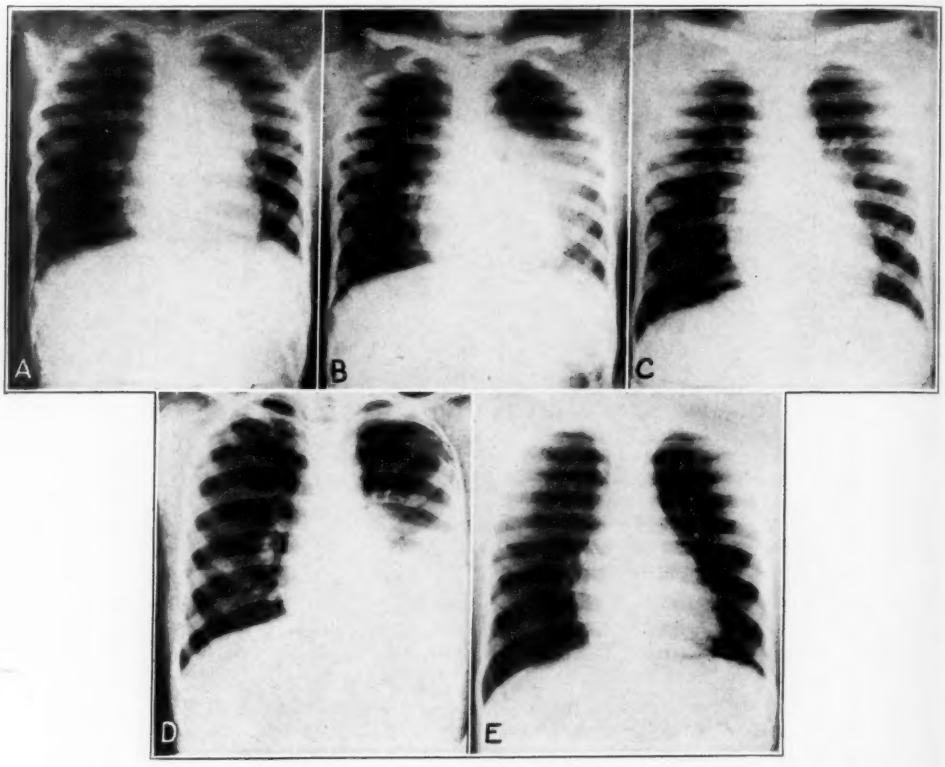

Fig. 2 (case 2).—Roentgenograms taken on: *A*, May 26, 1928; *B*, July 6, 1928; *C*, Sept. 12, 1928; *D*, Dec. 31, 1928; *E*, April 1, 1929.

fields were dull. The breath sounds were bronchial over the left upper part of the chest; fremitus was decreased, and coarse râles were heard.

Course.—There was a continuous rise in temperature to around 39 C. (102.2 F.) for two weeks. The fever subsided gradually, and the temperature became normal about the sixtieth day. During the febrile period the appetite was poor, and there were loss of weight, persistent cough and pain in the left side of the chest. With the establishment of normal temperature, the general condition improved, and the child was discharged on the one hundred and thirteenth day (Sept. 19, 1928) with a gain of 9 Kg.

On May 26, 1928, the physical findings were dulness and distant breath sounds of bronchial quality in the left interscapular space. No râles were heard.

On August 14, nothing but dulness on percussion in the left upper part of the chest was found. There had been a remarkable improvement in the general well-being of the child.

Readmission.—On Jan. 6, 1929, it was found that the child had felt well and gained in weight up to one month previously, when she contracted a "cold," coughed, had pain in the left side of the chest and lost weight. The weight on readmission was 39.9 Kg.; the temperature, 37.8 C. (100 F.). The percussion note was dull at the base of the left lung and in the left axilla, and the breath sounds were of decreased intensity. Crepitations were heard in the same regions.

During her second stay in the hospital, the child showed no symptoms referable to the pulmonary lesion. The temperature was normal, and the gain in weight excellent. She was discharged to Warrensville Sanatorium on the ninety-sixth day, weighing 47 Kg. Friction rub was heard at the base of the left lung, and there was flatness to percussion in this area.

Roentgenograms.—May 26, 1928: A dense shadow with a convex periphery radiated from the left hilus a considerable distance into the pulmonary field.

June 25, 1928: There was a homogeneous shadow which occupied the left pulmonary field between the fifth and ninth ribs, leaving the costophrenic angle and the extreme axillary border free. The intercostal spaces were smaller on the left. The heart was in the normal position. Hence the shadow was probably an infiltration of the middle lobe of the right lung and not an interlobar effusion. The mediastinum was broadened.

July 6, 1928: The picture was about the same.

July 23, 1928: The shadow had retreated to the left hilus.

Aug. 9, 1928: The shadow was smaller than in the previous film and was confined to the left hilus between the shadows of the pulmonary artery and the left ventricle.

Sept. 12, 1928: There was no change in the condition of the chest.

Dec. 31, 1928: A uniform density occupied the entire left lower pulmonary field from the sixth rib to the diaphragm. The intercostal spaces were not widened; the heart was in the normal position; the film taken with the patient in the upright position showed no change in the level of density. The diaphragm—as could be seen by the position of an air bubble in the stomach—was not depressed. The shadow was therefore not due to an effusion, although, of course, a small amount of fluid may have been present in the phrenicocostal angle.

Jan. 7, 1929: The shadow was gradually diminishing in intensity. In the sixth intercostal space the linear shadow of interlobar pleurisy appeared. The diaphragm was higher on the left than on the right.

Feb. 5, 1929: The pulmonary fields were clear. The phrenicocostal angle on the left was obliterated.

April 1, 1929: The pulmonary fields were clear.

July 28, 1930: The pulmonary fields were clear. In the left hilar region there were acinous masses of great density which probably represented calcification of the lymph nodes. The diaphragm showed tenting in the region of the cardiac apex.

The course of this child's tuberculous infection shows three periods of progressive disease. The greater portion of the second period, which probably lasted three months, was observed in the Babies and Childrens Hospital. The history shows that none of the signs and symptoms which are commonly associated with tuberculous pneumonia were absent: high and protracted fever, severe cough, anorexia, loss of weight

and the typical signs of pulmonary infiltration. On retrospect, it is now possible to make a diagnosis of a resolving exudate; during the period of fever and infiltration no other diagnosis but that of tuberculous pneumonia was justified. The ultimate issue—whether of caseation or of resolution—was revealed solely by the course.

The following case emphasizes the points mentioned: (1) that serious constitutional symptoms may be present during the development of a resolving exudate; (2) that physical signs, even râles, may be elicited and (3) that the resolution of the infiltrations may be complete. At the time of discharge from the hospital, the lesion adjacent to the mediastinum had not yet resolved. It probably represents involvement of the hilar node. The resolution of the homogeneous shadow of the upper lobe of the right lung did not follow the uniform and orderly course which McPhedran [3] observed in his cases of benign massive exudates. I do not believe that the structure of the roentgenographic shadow is of decisive value in the differentiation of resolving exudates and caseous pneumonia.

CASE 3.—*History.*—F. W., a colored girl, aged 15 months, was admitted to the hospital on July 29, 1926. The chief complaints were: poor gain since 6 months of age, fever, "cold," fluctuant mass of the right hand and abscess and sinus of the left calf. Physical examination showed nothing but a draining sinus from a tuberculous scrofuloderm of the left calf and an abscess of the right hand arising from a tuberculous periostitis of a metacarpal bone. The weight was 7.4 Kg. The reaction to tuberculin, tested by the intracutaneous administration of a dilution of 1:1,000, was 3 plus.

Course.—For seven weeks the temperature was normal, with occasional peaks to 38.5 C. (101.3 F.). On September 15, subfebrile temperatures appeared, and the child showed poor appetite, diarrhea, dehydration and loss of weight. The temperature became normal in the first week of November.

On September 1, physical examination revealed dulness and decreased breath sounds of bronchial quality in the right upper part of the chest.

On September 22, coincident with a further rise in temperature, râles appeared in the same region.

On discharge (Feb. 10, 1927) only dulness in the right upper part of the chest could be elicited. A guinea-pig inoculated with pus from the sinus in the calf showed tuberculosis at autopsy.

On Oct. 16, 1929, a social service report stated that the child was well.

Roentgenograms.—July 29, 1926: A light, indefinite shadow was seen in the right upper pulmonary field just adjacent to the mediastinum. In subsequent views this shadow spread (August 30) and became denser until on September 21, it occupied the entire right upper lobe. It was dense and uniform and had a lower border which was sharp and probably coincident with the lesser interlobar fissure. The resolution was gradual and irregular, so that the shadow became spotty (Dec. 14, 1926). The interlobar fissure remained present in the form of a linear shadow.

3. McPhedran, F. M.: The Diagnosis and Classification of Pulmonary Tuberculosis in Childhood and Adolescence, Am. Rev. Tuberc. **20**:532, 1929.

April 11, 1927: Nothing was seen but a haziness of the right upper pulmonary field and a localized enlargement of the mediastinal shadow at the right hilus in which there was an area of increased density. This may have represented calcification.

The infiltration in case 1 probably did not occur at the seat of a primary infection. In such patients the mode of transmission by which

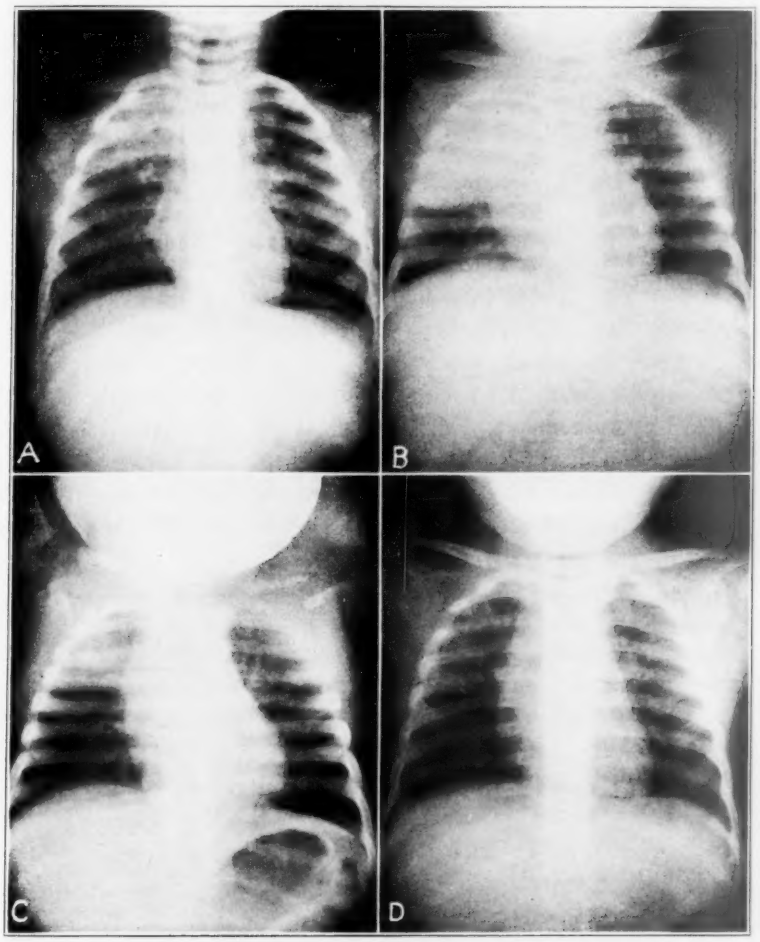

Fig. 3 (case 3).—Roentgenograms taken on: *A*, Aug. 30, 1926; *B*, Sept. 21, 1926; *C*, Dec. 14, 1926; *D*, April 11, 1927.

these secondary exudates arise is of great interest. Bronchiogenic dissemination seems improbable, when, as here, an upper lobe is exclusively involved. Cavity or rupture of a caseated node, the common sources of bronchial spread, was not demonstrated. A direct trans-

mission of bacilli from the diseased hilar nodes to the pulmonary parenchyma cannot occur, since the circulation of lymph is from the periphery to the interior. Such a mechanism is possible only in a cirrhotic form of phthisis, when an actual tuberculous lymphangitis develops at the hilus and spreads by contiguity in much the same fashion as pulmonary carcinoma. The remaining possibility is that of hematogenous seeding. It is now admitted that in active tuberculous disease tubercle bacilli enter the blood stream in moderate numbers not infrequently, though inconstantly. The reaction of the lung to such an invasion will depend in large measure on three factors: (1) the number of invading bacilli, (2) the total amount of pulmonary parenchyma involved and (3) the degree of sensitivity to tuberculoprotein acquired by the tissue. Clumping of the bacilli will tend to increase the inflammatory reaction because of the concentration of noxious substances. Lastly, there are probably forces of resistance other than allergy. So many factors, each one varying in degree from case to case, permit the development of innumerable varieties of tuberculous disease.

The resolving exudate which appears about a primary focus has been described by Simon and Redeker.[4a] It is probable that these lesions are caused by tuberculous inflammation along the route of lymphatic drainage from a primary focus in the lung to the lymph nodes of the mediastinum. Their roentgenologic demonstration is often difficult; an increase in pulmonary markings may be the only sign of their presence. Again, however, as in the cases to be described, they cast dense shadows of considerable size. When they occur in the right side of the chest, a differentiation from exudates in the lesser pleural fissure is often difficult and may be possible only with the aid of a correlated study of views taken in several different diameters, notably the lateral.[5] Complete resolution may occur and leave nothing but areas of calcification at the primary focus and in the primary node. In other cases tissue is irretrievably destroyed, and atelectatic areas of fibrosed lung remain. I append the pathologist's description of such a case seen in the Babies and Childrens Hospital and examined post mortem in the Institute of Pathology of the School of Medicine of Western Reserve University.

CASE 4.—A. C., a white girl, aged 16 months, died, and autopsy was performed on Feb. 5, 1931.

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4. Simon, Georg, and Redeker, Franz: Praktisches Lehrbuch der Kindertuberkulose, ed. 2, Leipzig, Curt Kabitzsch, 1930, (*a*) p. 195; (*b*) p. 11.

5. Reichle, H. S., and York, C. H.: Roentgenographic Study of Pulmonary Disease in Childhood: Use of the Lateral and the Oblique Diameters of the Chest, Am. J. Dis. Child. **45**:307 (Feb.) 1933.

Description of Lung.—On the right side there were dense fibrous adhesions and complete obliteration of the anterior portion of the interlobar septum between the upper and middle lobes. In the upper lobe on the pleural surface, near the interlobar septum, there was a firm yellow area 1 cm. in diameter with central caseation. The bronchi were normal, with the exception of those to the lower portion of the upper lobe. In this location the bronchi and larger bronchioles were dilated and had trabeculated walls and false diverticulae. A section removed showed [on microscopic examination] a complete metaplasia of the epithelium to a low cuboidal basophilic type with extensive fibrosis in the surrounding areas. There was one large area of caseation surrounded by a thin layer of fibrous tissue.

All of these lesions, irrespective of their ultimate fate, are associated with and, in my opinion, indicative of active tuberculous disease. There is no clinical characteristic by which the clinician can separate the benign types from the destructive types. There are, moreover, no reasonable grounds for assuming that there is any anatomic difference in principle between them.

The following two cases illustrate the resolving exudates which develop at the site of the primary complex. I again call attention to the severe constitutional symptoms and the physical signs. Recurrence of the lesion as in case 6 was also observed in cases 1 and 2. Langer [6] and Goldberg and Gasul [7] have described recrudescence of a resolving exudate in the train of a severe general reaction to tuberculin. In my cases I was not able to discover either an immediate or a predisposing cause. Tuberculous disease in the infant and child has a characteristic tendency to run in cycles the ebb and flow of which mark periods of progression and retrogression. This fact has long been known and has been much commented on in the German literature (Simon and Redeker [4b]). Since one is able to exclude exogenous reinfection and intercurrent respiratory disease in the individual case, but cannot measure the variations of immunity, no sufficient cause for the particular renewal of activity can be demonstrated. Whatever the precipitating factors may be, their effectiveness depends on the unstable equilibrium which exists between the resistance of the body and the virulence of the organism.

Case 5.—*History.*—H. F., a colored girl, aged 2 years, was admitted to the hospital on June 13, 1928. The child had suffered from a cough, high fever and anorexia for four weeks; there had been a steady loss of weight. Contact had occurred with an aunt who had died of tuberculosis the previous year. The weight was 9.4 Kg. The turgor and tonus were poor. The percussion note was frankly

6. Langer, H.: Die Spezifität rückbildungsfähiger Lungeninfiltrate bei kindlicher Tuberkulose (sog. epituberkulöse Infiltration), Ztschr. f. Kinderh. **34**:142, 1922.

7. Goldberg, B., and Gasul, B. M.: Epituberculosis: Report of an Unusual Case with Autopsy Findings, Am. Rev. Tuberc. **24**:285, 1931.

dull over the right upper part of the chest, both anteriorly and posteriorly; the breath sounds were distant and high-pitched.

Course.—The temperature rose intermittently and remittently to as high as 39.5 C. (103.1 F.). The fever gradually abated after two weeks, and only subfebrile temperatures were present from then on. Gain in weight began, and the

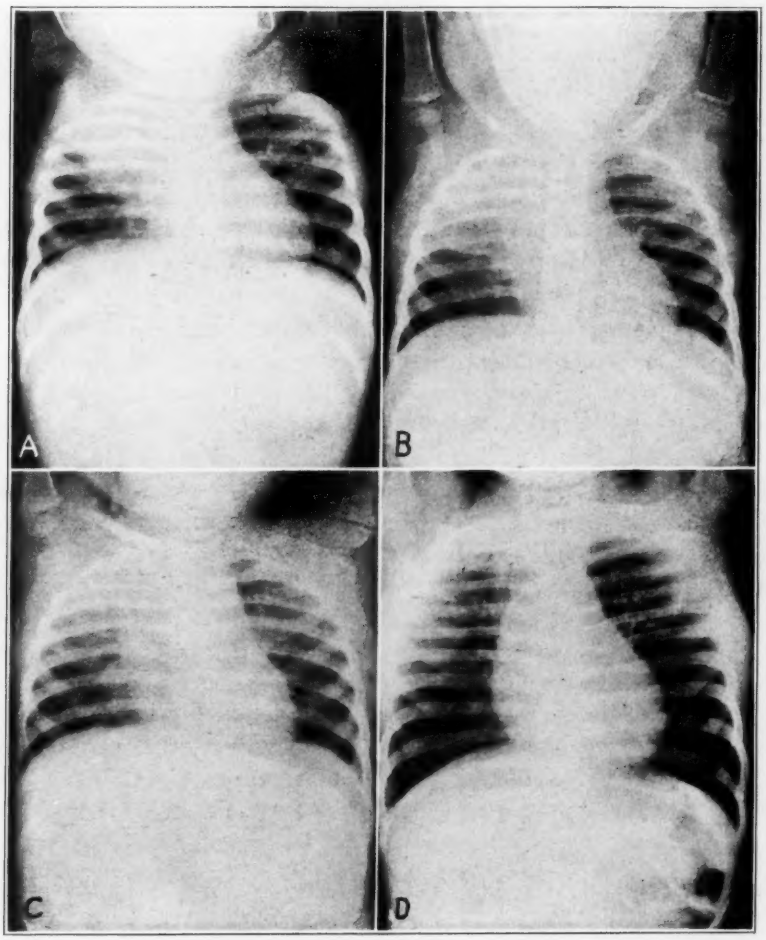

Fig. 4 (case 5).—Roentgenograms taken on: *A*, June 14, 1928; *B*, July 14 1928; *C*, Oct. 3, 1928; *D*, Sept. 5, 1931.

child was discharged at the end of one hundred and forty-one days, with a total gain of 4.2 Kg. The appetite was consistently poor, and the feedings had to be forced. Physical examination revealed the same findings as on admission.

Reexamination.—The patient was reexamined on Sept. 5, 1931. In the interim she had varicella and had been in contact with a foster father, who died of pulmonary tuberculosis in April, 1931. Physical examination revealed an excellent

state of general health, good panniculus and turgor, and a decrease in resonance over the right upper anterior and posterior parts of the chest. There was no cough.

Roentgenograms.—June 14, 1928: A dense homogeneous shadow occupied the right upper pulmonary field. Along the right cardiac border there was mottling, which extended down to the diaphragm.

June 18, 1928: The condition was about the same.

July 14, 1928: The shadow in the upper part of the right lung was decreasing in extent and density. The mediastinal shadow was broad and had a convex border

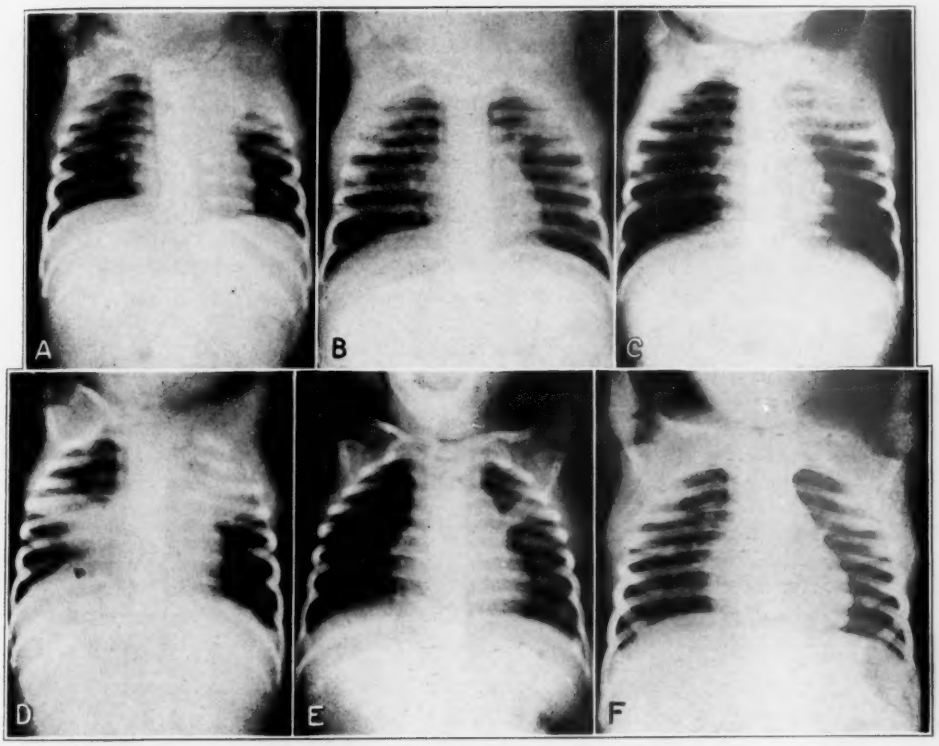

Fig. 5 (case 6).—Roentgenograms taken on: *A*, April 4, 1928; *B*, May 24, 1928; *C*, Sept. 13, 1928; *D*, Oct. 31, 1928; *E*, Jan. 28, 1929; *F*, July 21, 1930.

on the right. In the sixth intercostal space there was a linear shadow probably caused by a thickening of the lesser pleural fissure.

Aug. 25, 1928: The roentgenogram was like that of the prevoius date.

Oct. 3, 1928: Only the uppermost part of the right pulmonary field was occupied by a dense shadow. The mediastinum was still very broad.

Sept. 5, 1931: The pulmonary fields were entirely clear. In the second right intercostal space there was a dense, irregular shadow, which probably was a shadow of Ghon's focus. The right lateral view demonstrated that it was in the anterior aspect of the chest.

Case 6.—*History.*—E. A., a colored girl, aged 2 years, was admitted to the hospital on April 5, 1928. The infant had been in contact for one year with the

foster father, who was suffering from open pulmonary tuberculosis. There were no complaints. The weight was 9.5 Kg. Physical examination gave negative results. The reaction to the intracutaneous tuberculin test (1:10,000) was positive (4 plus).

Course.—A remittent and intermittent fever, which reached 40 C. (104 F.), was sustained until February, 1929, when the temperature became normal. The gain in weight during the period of observation in the hospital (three hundred and seventy-four days) was 2.1 Kg. There were a cough and stridorous respiration. Physical examination revealed suppression of breath sounds over the left upper anterior pulmonary field. The supraclavicular nodes increased in size; the left one was the size of a walnut; it became fluctuant. Pus was obtained by puncture and was proved to be of tuberculous nature by inoculation into a guinea-pig.

Reexamination.—On July 21, 1930, the weight was 13.3 Kg. The general tone and turgor were excellent. There were no complaints and no positive findings.

Roentgenograms.—April 4, 1928: There was a dense homogeneous shadow in the left upper pulmonary field. In later views this was seen to be breaking up into linear shadows.

May 24, 1928: The left pulmonary field was clear, although a globular shadow remained at the left hilus.

As shown by several roentgenograms, the condition remained stationary until Sept. 13, 1928, when the dense homogeneous shadow reappeared in the left upper pulmonary field.

Oct. 31, 1928: Dense shadows were seen at the right hilus and along the right cardiac border, which were probably caused by exudates in the right major and minor fissures.

Jan. 28, 1929: Nothing pathologic remained, but there was a peculiar band shadow proceeding from the left hilus to the axilla. This may have been due to an infiltration along the line of lymphatic drainage from a tuberculous focus in the lung. In the subsequent roentgenograms the gradual retreat of this shadow toward the hilus could be seen. The resolution of this infiltration followed the course described by McPhedran [3] for the wedge-shaped shadows, class C. A roentgenogram taken at the reexamination (July 21, 1930) showed dense mottling at the left hilus, probably indicative of calcification of the primary node and increased pulmonary markings in the left upper pulmonary field.

As is shown in the succeeding case, a bronchiogenic dissemination of tuberculous material may also call forth a resolving exudate.

CASE 7.—*History.*—A. J., a colored girl, aged 4½ years, was admitted to the hospital on April 2, 1929. The child had been in intimate and prolonged contact at home with a tuberculous stepfather and stepsister. Since January, 1929, she had had fever, a severe cough and anorexia. The reaction to the intracutaneous tuberculin test (1:1,000) was positive. Two weeks previously a mass had appeared in the right supraclavicular fossa. The child had ceased to gain weight six months previous to the date of admission.

Examination.—A lymph node the size of a pigeon's egg was felt in the supraclavicular fossa (fig. 6). The percussion note was impaired below the right clavicle. The right side of the chest moved less than the left. No râles were heard, and the breath sounds were normal.

Course.—The temperature remained at 39 C. (102.2 F.) for two weeks. From that time until May 26 it was normal, with occasional peaks. Then fever again appeared; the gain in weight was poor, and there was anorexia for a period of

about three weeks. The lymph node became fluctuant on Aug. 22, 1929. The disposition, however, remained happy. There was an unproductive cough, which became brassy and bitonal on October 23. On December 5, a tympanitic note was elicited on percussing over both bases. The breath sounds were decreased in intensity over the right upper pulmonary field, and there was a prolonged expirium. Musical râles were heard. The reaction to tuberculin (intracutaneous), in a dilution of 1 : 1,000, was 3 plus.

The child was transferred to Cleveland City Hospital, Contagious Division, on Feb. 1, 1930, because of contact with varicella and while there she received varicella convalescent serum.

Readmission.—On February 21, the child showed stertorous respiration and a cough, but had absolutely no sense of illness. The supraclavicular node was soft but of the same size as on discharge. The findings in the chest were not changed. On March 9, râles appeared over the entire anterior aspect of the thorax, and the tracheal breath sounds were more clearly transmitted both directly over and to the left of the sternum. Over the right upper anterior aspect of the chest the breath sounds were diminished in intensity, except for one area in the third intercostal space, where they were tubular; over the right upper posterior part of the chest

Fig. 6 (case 7).—Photographs taken on Aug. 29, 1929.

they were of undiminished intensity, but were high-pitched and accompanied by râles.

On March 12, the temperature rose to 40 C. (104 F.), the child showed signs of intoxication, and she expectorated considerable amounts of purulent material. Dulness, decreased breath sounds and râles developed over the entire right side. The clinical diagnosis of bronchiogenic dissemination was verified by a roentgenogram taken on March 21, which showed a new shadow in the right lower pulmonary field. Coincident with these events, the right supraclavicular node decreased in size, so that by March 20 it was barely palpable. At the same time the stertorous breathing disappeared. All these signs indicated a release of pressure on the bronchus. On March 28, tracheal breath sounds of decreased intensity were heard in the right lower anterior part of the chest. Over the entire right anterior part of the chest the percussion note was dull.

On June 10, the child had begun to gain weight; her appetite was good. There were no manifest signs of activity. The cough was less. On October 1, physical examination showed dulness in the right upper part of the chest. The right side of the chest was smaller than the left. The supraclavicular node could just be felt. On November 11, a sedimentation test showed only a slight increase in rate (16 mm. in the first hour). On the final examination, pure tracheal breath sounds

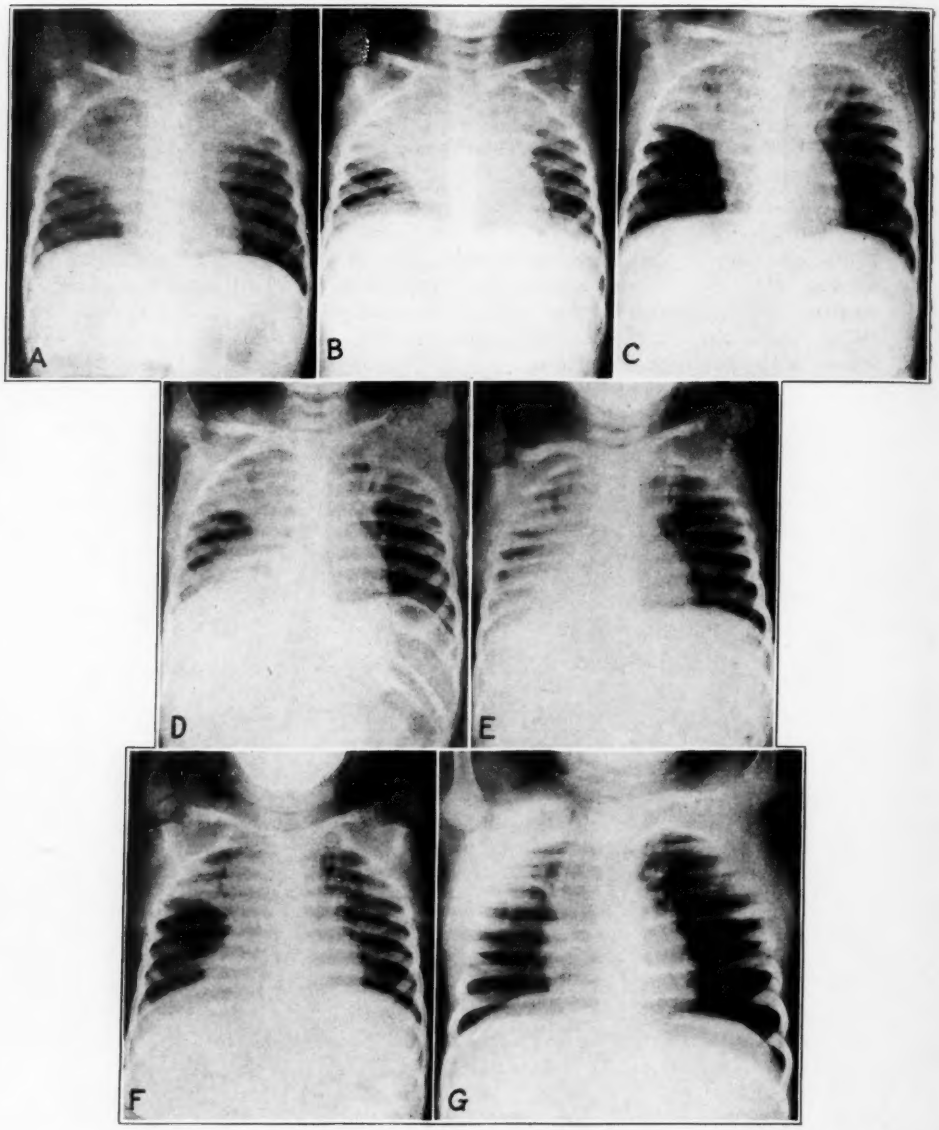

Fig. 7 (case 7).—Roentgenograms taken on: *A*, March 28, 1929; *B*, July 18, 1929; *C*, Feb. 24, 1930; *D*, March 21, 1930; *E*, April 8, 1930; *F*, June 30, 1930; *G*, Sept. 24, 1932.

were found in first right intercostal space. This was probably caused by a displacement of the trachea. Over this area, too, there was an increased tactile fremitus and a high-pitched percussion note. The supraclavicular node was barely palpable. The child was discharged to Rainbow Hospital for Convalescent Children. The reaction to tuberculin, in a dilution of 1:10,000, was 3 plus. The weight was 26 Kg., which represents a gain of 4.6 Kg. in two hundred and eighty-five days.

Reexamination.—On March 17, 1931, the child was in excellent general condition. There were no signs of activity.

On Oct. 23, 1932, the child was happy and at least 15 pounds (6.8 Kg.) overweight. Both sides of the chest moved equally. No mass was palpable in the right supraclavicular space. The percussion note was slightly increased below the right clavicle, but otherwise no abnormal signs were elicited.

Roentgenograms.—March 28, 1929: There was a dense shadow in the left upper pulmonary field, whereas the shadow on the right was not of uniform density.

July 18, 1929: Both shadows were dense and homogeneous.

Sept. 26, 1929: There was the first indication of a cavity in the right upper pulmonary field just above a linear shadow (right lesser fissure?).

Feb. 24, 1930: The condition was much the same as in the previous film.

March 14, 1930: The cavity was still present. The right lower pulmonary field was clear.

March 21, 1930: There was a mottled shadow of considerable density along the right cardiac border in the right lower pulmonary field. The shadow in the left upper pulmonary field was smaller.

April 8, 1930: Practically the entire right pulmonary field was dense. There was a fringe of exudate in the main pleural space.

June 30, 1930: The pulmonary fields were clearing. All shadows were breaking up progressively into dense bands. This was best seen in the plate taken on March 17, 1931.

Sept. 24, 1932: Both upper pulmonary fields contained linear shadows and dense mottling. The process appeared to be inactive. The residuum was probably due to fibrosis and calcification.

On admission this child had dense homogeneous infiltrations of both upper pulmonary fields. Cavitation occurred on the right. Six months later the patient had a high temperature and signs of intoxication. The cough, which had been unproductive, now produced large amounts of purulent material. Dulness and many râles were heard over the entire right side. The roentgenogram revealed an infiltration and pleurisy with effusion at the right base. This bronchiogenic spread may have been due to dissemination from the cavity. I incline, however, to the view that its source was a tuberculous mediastinitis, because a large right supraclavicular lymph node which had been present for about a year and had been fluctuant for six months disappeared within several days of the onset of the fever. At the same time the brassy and bitonal cough and the asthmatic breathing from which the child had been suffering as a result of mediastinal pressure disappeared. The subsequent history of this case is that of almost complete resolution. The last roentgenogram, taken three and a half years after the first admission to the hospital and two years after the onset of bronchiogenic

dissemination, shows a thickened minor fissure on the right, and a broad mediastinal shadow and increased pulmonary markings in both upper pulmonary fields. That there had been some diminution in the volume of the right lung—probably as a result of fibrosis—is proved by the position of the heart, which is situated somewhat to the right of the normal position. Bilateral and multiple lesions of great extent, cavitation, bronchiogenic dissemination and severe constitutional symptoms were present in lesions which subsequently resolved.

The following case illustrates the same conditions. The child was infected early and, since the father was not susceptible to hygienic discipline, was in all likelihood repeatedly reinfected. The extensive areas of lung involved, the persistence of the infiltration and the appearance of contralateral lesions warranted a grave prognosis. In fact, the case united almost all the points which have been suggested by Eliasberg and Neuland [8] as signs and symptoms of differential value in the diagnosis of caseous pneumonia and "epituberculosis." The onset was sudden and the course severe. The temperature was high. Typical signs of consolidation were elicited. There was a multiplicity of pulmonary lesions. During the acute attacks the general condition of the child was very bad, and a fatal outcome seemed imminent. Even the blood count was of the type that is usually regarded as of serious prognostic import. From Nov. 2, 1929, until June 27, 1930, the white cells ranged from 10,000 to 20,000, and the neutrophilic percentage, from 53 to 86.

CASE 8.—*History.*—M. R., a white girl, aged 3 years, was admitted to the hospital on July 20, 1929. The child had been in contact with a tuberculous father since birth. She had gained weight and enjoyed a good appetite, although fever and cough were present. The disposition was happy.

Examination.—The child was of asthenic type and blond. The weight was 13.8 Kg. The percussion note was impaired over the right upper anterior part of the chest and frankly dull at the base of the right lung; the breath sounds were decreased in intensity over these areas. No fever was noted during the child's stay in the hospital, but there were a brassy cough and stridor on inspiration. The appetite was good, and the child gained 2.1 Kg. in one hundred and one days.

She was discharged from the hospital on Oct. 29, 1929.

Second Admission.—The patient was readmitted to the hospital on Nov. 2, 1929. The parents had experienced great difficulty in feeding the child; the cause was probably a behavior problem, since her weight was 15 Kg., and the general condition was good. The right side of the chest moved less than the left. The brassy cough was still present. The right supraclavicular node was palpable. The spleen could not be felt. There was no fever, and the child gained weight.

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8. Eliasberg, H., and Neuland, W.: Die epituberkulöse Infiltration der Lunge bei tuberkulösen Säuglingen und Kindern, Jahrb. f. Kinderh. **93**:88, 1920; Zur Klinik der epituberkulösen und gelatinösen Infiltration der kindlichen Lunge, ibid. **94**:102, 1921.

In February, 1930, fever (38 C. [100.4 F.]) developed, which on February 19 became septic and reached 40 C. (104 F.). The fever continued in this fashion, even touching 41 C. (105.8 F.), until April 4, when the temperature became normal.

On June 23, another period of fever developed. This lasted for three days; from then on the temperature was normal.

During the febrile periods the asthmatic attacks and an increase in the brassy cough were noticed. The spleen became palpable, and the child showed severe constitutional symptoms. Examination of the chest repeatedly revealed the same

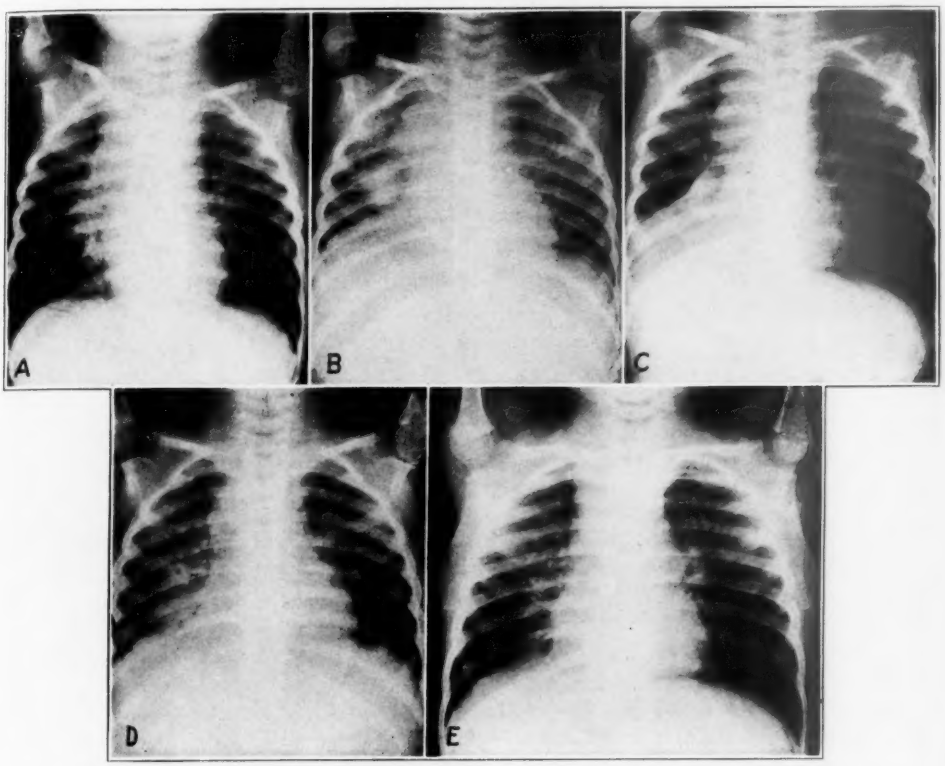

Fig. 8 (case 8).—Roentgenograms taken on: *A*, June 17, 1929; *B*, Aug. 6, 1929; *C*, Aug. 17, 1929; *D*, May 24, 1930; *E*, Jan. 16, 1931.

findings: a flat percussion note at the right angle of the scapula, in the right axilla and in the right lower anterior part of the chest, a decrease in the intensity of the breath sounds over the same areas and an impairment of the movements of the right side of the chest. No râles were found.

The child improved in July; there was an excellent gain in weight. On September 30, there were equal and symmetrical movements and undulatory phenomena of both sides of the chest. The percussion note and the breath sounds were normal. The cough was still paroxysmal.

Third Admission.—On November 9, the reaction to tuberculin (intracutaneous), in a dilution of 1: 100,000, was 2 plus. The sedimentation rate of the erythrocytes

(method of Westergren) in the first hour was: first test, 9.5 mm.; repetition, 9 mm.; second repetition, 8.5 mm. The weight was 19.5 Kg. Physical examination of the chest revealed no pathologic findings. The child had no fever.

Roentgenograms.—June 17, 1929: The mediastinal shadow was abnormally wide. Mottling by dense shadows was seen in the right upper pulmonary field and along the right cardiac border.

July 22, 1929: Shadows which had a convex periphery were seen along the entire mediastinum in the right lung. Globular shadows were present in the pulmonary field itself.

Aug. 6, 1929: The dense globular shadow found in the right midpulmonary field was more prominent.

Aug. 17, 1929: There was a dense homogeneous shadow with a sharp upper border in the right lower pulmonary field. Fluoroscopy demonstrated that this was situated in the middle lobe of the right lung.

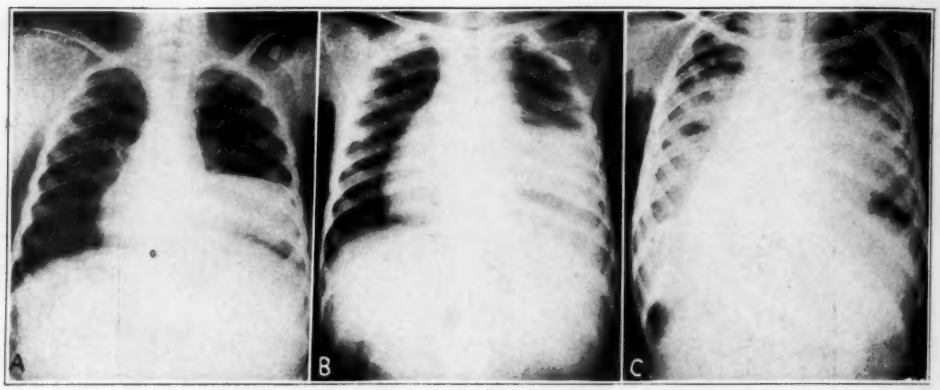

Fig. 9 (case 9).—Roentgenograms taken on: *A*, Oct. 14, 1926; *B*, March 19, 1927; *C*, Aug. 8, 1927.

Aug. 27, 1929: The shadow in the middle lobe of the right lung had retreated to the cardiac border. The globular shadow of August 6 had again appeared. This was shown by a lateral plate to be in the lower lobe of the right lung.

Nov. 29, 1929: The dense shadow in the right side of the chest again appeared. Oblique views [5] demonstrated that this was in the position of the middle lobe.

Dec. 5, 1929: There was again a complete consolidation of the middle lobe of the right lung. Resolution began about May 24, 1930.

May 24, 1930: The lobar shadow on the right was decreased in size and had broken up into areas of dense mottling situated near the cardiac border. There was a linear shadow which probably represented a thickening of the lesser pleural fissure. The convex shadows of a lymphadenopathy were present. In them were densities which may have represented calcification.

July 5, 1930: There was a typical bandlike shadow of an exudate of the right minor fissure. An infiltration may have been present at the cardiac apex. Calcification was evident in the right paratracheal region.

Sept. 4, 1930: All shadows had cleared to a remarkable degree.

Oct. 10, 1930: The shadows continued to clear, but at the left hilus a new globular shadow had appeared which was probably caused by a hilar lymphadenopathy.

Jan. 16, 1931: Dense linear shadows near the right cardiac border were all that remained of the original infiltrations. The linear shadow in the right pulmonary field was probably a thickened minor pleural fissure. The left hilus was dense and irregular.

Sept. 30, 1932: There had been no further change in the roentgenogram of the chest.

It has been my experience that the one essential difference between the resolving exudate and the frank caseous pneumonia is the course. The former improves when once it has reached its full bloom, whereas in the case of the latter the patient declines and passes into the cachectic stage unless a complication, such as miliary tuberculosis, ends the course acutely. This, however, is not a clinical differentiation of two different entities, but merely a difference in the course of the same disease.

Case 9 demonstrates the malignant course and fatal termination of a homogeneous infiltration in the middle lobe of the right lung. The symptoms, signs and roentgenographic observations should be compared with those of the resolving exudates described, and it will be seen that until late in the disease—from six to eight months after the first observation on Oct. 4, 1926—there is no essential difference. It is particularly important to note that for five months only a slight increase in the width and density of the mediastinal shadow indicated any change in the lesion. The fatal issue could not have been predicted before April, 1927, when cachexia first appeared.

Case 9.—*History.*—R. M. T., a colored girl, aged 6 years, came to the Babies and Childrens Dispensary on Oct. 4, 1926, with the complaint of pain in the chest, cough and coryza. She returned nine days later with the report that she was still coughing, but that her general condition and appetite were better. Although at her first visit râles had been heard, this time the chest was clear. An intracutaneous tuberculin test (1:1,000) was done and was found to be positive. A description of the roentgenogram taken on Oct. 14, 1926, will be given subsequently.

Five months later she returned to the dispensary. She had apparently felt well in the interval. Her complaint now was of fever and pain in the chest and abdomen. Her appetite was poor; there was a cough. The attending physician discovered dulness over the lower right anterior part of the chest and râles at the base of the right lung. The patient was admitted to the Babies and Childrens Hospital on March 18, 1927. No history of contact was obtained.

The temperature was 38 C. (100.4 F.); the weight was 19.4 Kg. The reaction to tuberculin (intracutaneous), in a dilution of 1:1,000, was positive. The right side of the chest was restricted in its movements. There was flatness to percussion in the right axilla; at the base of the right lung the breath sounds were decreased in intensity, and coarse râles were heard.

Course.—In the first two weeks the fever was intermittent and reached 41 C. (105.8 F.). Later it became remittent. There was a steady loss of weight. Anorexia and vomiting were present. Signs over the right lower pulmonary field increased. By April 12, the child had become cachectic. On June 15, she expectorated a large amount of mucopurulent material. On June 8, amphoric breath sounds were heard to the right of the spine, and signs of diffuse infiltration were

present over the entire right side of the chest. On July 16, hemoptysis occurred, and signs of infiltration appeared on the left side. On August 8, meningitis had apparently set in and the patient died on August 10.

Autopsy.—The retrosternal, left supraclavicular, paravertebral and mediastinal nodes were large, caseated and in part ruptured. There was a chronic adhesive proliferative pleurisy, which was in part caseated. The middle lobe of the right lung was completely caseated. The right main bronchus was filled with cheesy material, which apparently came from a ruptured mediastinal node. The lingula pulmonis was the site of a caseous bronchiogenic tuberculosis. There was a miliary tuberculosis of the other lobes. Conglomerate tubercles were found in the spleen and kidneys. Other findings were: hydrocephalus, caseation of the mesenteric lymph nodes and tuberculous enteritis.

Roentgenograms.—Oct. 14, 1926 (five months before admission to the hospital): A dense, homogeneous shadow completely occupied the position of the middle lobe of the right lung. There was a broad mediastinal shadow.

March 19, 1927: The mediastinum was widened; the pulmonary fields were the same as before.

April 19, 1927: The right upper pulmonary field was pushed away from the wall of the chest by a band of uniform density, probably caused by pleurisy. The pulmonary fields were unchanged.

May 16, 1927: The shadow had extended into the right upper pulmonary field.

June 6, 1927: Mottling had appeared at the apex of the heart. There was fluid in the left side of the chest.

Aug. 8, 1927: There was a tremendous increase in the size and extent of the shadows.

COMMENTS

Several authors have suggested that the presence of tubercle bacilli in the sputum is an absolute indication for the diagnosis of caseous pneumonia. However, Schlack,[9] Fernbach,[10] Friedenberg,[11] Duken,[12] Peyrer,[13] Grävinghoff[13] and Harms[13] have found the organism in cases which they recognized as "epituberculous." Opitz,[14] in fact, was able to demonstrate the organism by inoculation into guinea-pigs of the stomach contents in twenty-eight of thirty cases.

It has been thought possible to differentiate caseous pneumonia from the resolving exudate by the roentgenogram. The best work on this subject has been published by McPhedran.[3] He differentiated between a group B, the progressive or unstable shadows, i. e., the caseous pneumonias, and a group C, the retrogressive and benign infil-

9. Schlack, H.: Die Frage der sog. epituberkulösen Infiltration der Lungen, Beitr. z. Klin. d. Tuberk. **63**:275, 1926.

10. Fernbach, H.: Die epituberkulöse Infiltration, Beitr. z. Klin. d. Tuberk. **69**:514, 1928.

11. Friedenberg, quoted by Fernbach.[10]

12. Duken, J.: Die Besonderheiten der Röntgenologischen-Thoraxdiagnostik im Kindesalter, Jena, Gustav Fischer, 1924, p. 102.

13. Quoted by Duken.[12]

14. Opitz, H.: Neue Forschungen über die Diagnose der Lungentuberkulose durch Bazillennachweis, Deutsche med. Wchnschr. **56**:1995, 1930.

trations, i. e., the resolving exudates. I have shown that the benign infiltrations which have been seen in patients at the Babies and Childrens Hospital of Cleveland were often remarkably unstable, retrogressing and reappearing during the course of several months (case 8). On the other hand, the infiltration in case 9, which showed a solid homogeneous shadow in the roentgenogram and which was proved to be a caseous pneumonia at autopsy, remained unchanged for half a year. In like manner the workers in this clinic have not been convinced that the uniformity of the individual shadow is a valuable indication of the ultimate prognosis. The resolving exudates seen here have sometimes broken up into discrete mottling and did not always retreat by a slow diminution of the wedge as described by McPhedran. Multiplicity of lesions may also occur. Hence I do not believe that the roentgenogram can differentiate between the two groups of pulmonary exudates or that it will permit early prognostic deductions. I believe that McPhedran [3] tacitly admitted this when he said: "The difference between *B* and *C*, both consolidations, is fundamentally that of their course" (p. 541).

CONCLUSIONS

From observations on one hundred and ninety tuberculous children, as illustrated in this paper by the report and discussion of eight cases of pulmonary tuberculosis, from the consideration of evidence drawn from the literature in the fields of pathology and bacteriology and from the autopsy material of this clinic as presented in study I, the following conclusions are arrived at regarding the interpretation of the resolving exudates in pulmonary tuberculosis of children:

1. The lobar infiltrations in the course of pulmonary tuberculosis are largely tuberculous pneumonias.

2. It is not possible to differentiate at an early stage between the resolving exudates of pulmonary tuberculosis and caseous pneumonia.

3. The term resolving exudate and all of the other terms that have been used for the same condition express not diagnosis, but prognosis.

4. There are no certain guides for early prognosis. Only the observation of a child over an extended period of time permits one to venture a dependable opinion.

Mr. D. G. Shields, of the roentgenologic and photographic staff of the Babies and Childrens Hospital, rendered technical assistance.

THE BLOOD DURING THE FIRST YEAR OF LIFE

I. NORMAL VALUES FOR ERYTHROCYTES, HEMOGLOBIN, RETICULOCYTES AND PLATELETS, AND THEIR RELATIONSHIP TO NEONATAL BLEEDING AND COAGULATION TIME

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AND

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With the technical assistance of Ray Bennett

NEW YORK

We have undertaken a study of the formed elements of the blood of normal infants during the first year, exclusive of the leukocyte and differential count, to secure a base line for comparison with the values in a group of premature infants, studied under identical conditions, to be reported in a later paper.[1a] A base line of this character appeared to be essential in order to avoid misinterpretation which might result from uncritical acceptance of normal standards developed in localities geographically and environmentally different from New York City. Because the results of the study do not conform completely with data available in the literature, because much confusion has arisen from the use of arbitrary hemoglobin standards and, lastly, because the data of other observers have usually not been subjected to statistical analysis, a separate report of this study has seemed warranted.

I. SURVEY OF LITERATURE

No exhaustive survey of the literature has been attempted. The first study of hemoglobin by modern methods was made by Williamson [1b] in 1916. We have therefore cited only a few investigations of the various blood elements prior to 1916, and have included only the most important studies since that date.

1. *Erythrocytes.*—The more important studies of erythrocytes at birth and throughout the first year are included in table 1.

2. *Hemoglobin.*—Williamson,[1] in 1916, studied a group of infants (presumably British) which included representatives of all economic and

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From the Department of Diseases of Children, the College of Physicians and Surgeons, Columbia University, the Babies' Hosiptal and the Sloane Hospital for Women.

1a. Merritt, K. K., and Davidson, L. T.: The Blood During the First Year of Life: II. The Anemia of Prematurity, Am. J. Dis. Child., to be published.

1b. Williamson, C. S.: Influence of Age and Sex on Hemoglobin, Arch. Int. Med. **18**:505 (Oct.) 1916.

social strata. The majority were breast fed up to 6 months of age, but no infant was included who had recently had any illness, had poor nutrition or who seemed below par. Details of feeding after six months were not given. Williamson [1] obtained blood from the ear, with a cataract knife. Determinations were made by a quantitative spectrophotometric method. His figures are shown in table 2.

TABLE 1.—*Erythrocyte Values of Various Investigators for Infants Throughout the First Year*

Author	Maximum	Minimum	Average	Comment
Mayers [20]	.....	.....	7,630,000	41 infants (37 taken at time of delivery)
Lippman: Am. J. Dis. Child. **27**: 473 (May) 1924	.....	.....	5,200,000	71 infants (at birth)
Zibordi [21]	.....	.....	6,320,000	Birth (number of observations not stated)
Lucas and co-workers [22]	.....	.....	5,511,000	31 infants (day of birth)
Lucas and Washburn: Clin. Pediat. **11**: 38, 1928	8,000,000	5,500,000	.....	At birth (number not stated)
	8,000,000	5,000,000	.....	3d to 5th day of life
	6,000,000	4,500,000	.....	14th day
	5,000,000	4,000,000	.....	6th month
	5,000,000	4,500,000	.....	12th month
von Farnos [24]	6,000,000	5,000,000	.....	83 infants (2 to 14 days old and up to 21 days) (erythrocytes sank to 4,000,000 in 1st week of life)
Slawik [25]	.....	.....	5,850,000	82 infants (1st day of life)
Opitz, in v. Pflaunder, M., and Schlossmann, A.: Handbuch. der Kinheilkunde, Leipzig, F. C. W. Vogel, 1931, vol. 1, p. 833	.....	.....	5,000,000	Infants (number and age not specified)
Börner [4]	.....	.....	5,060,000	30 infants (birth to 14 days)
McLean and Caffey [23]	6,800,000	3,500,000	.....	15 infants (5 hrs. to 120 hrs.)

TABLE 2.—*Williamson's Figures for Hemoglobin in Infants from Birth to One Year of Age*

Age	Gm. of Hemoglobin per 100 Cc. of Blood	Number of Cases
1 day	23.25	31
2-3 days	22.78	31
4-8 days	22.12	33
9-13 days	21.35	30
2 weeks-2 months	18.42	30
3-5 months	13.66	32
6-11 months	13.70	33
12 months	12.53	34

Appleton,[2] in 1918, studied one hundred and three healthy infants under 2 years of age. These infants were of normal weight, gained steadily, had good physical development and showed no disease, either acute or chronic. Ninety per cent of them were breast fed, but no other details of the diet are given. Blood was obtained from the infant's toe. The Palmer method was used and results expressed as percentages of hemoglobin, taking as 100 per cent Haldane's average for adults (13.8 Gm. per hundred cubic centimeters). Appleton's [2]

2. Appleton, V. B.: Determination of Hemoglobin During Infancy by the Palmer and Van Slyke Methods, J. Biol. Chem. **34**:369 (May) 1918.

figures are shown in table 3. (The hemoglobin equivalents in grams have been added by us.)

Drucker,[3] in 1923, studied seventy-four infants under 1 year of age. They were full term, of approximately normal weight, and had previously had no infectious disease (a transient afebrile cold was not counted). They had had no previous gastro-intestinal upset. Blood was taken from the heel with a razor. The hemoglobin determinations were made by an Autenrieth-Königsberger colorimeter. Drucker [3] made the interesting comment with regard to infants in the first two

TABLE 3.—*Appleton's Figures for Hemoglobin in Infants from Birth to Eleven Months of Age*

Age	Number of Cases	Average Percentage of Hemoglobin	Gm. of Hemoglobin per 100 Cc. of Blood
1 day	12	164	22.3
2-3 days	14	146	20.1
4-8 days	14	135	18.6
9-13 days	8	137	18.9
2-8 weeks	16	102	14.1
3-5 months	10	88	12.1
6-11 months	17	87	12.0

TABLE 4.—*Drucker's Figures for Hemoglobin in Infants from Two Weeks to One Year of Age*

Age	Number of Cases	Gm. of Hemoglobin per 100 Cc. of Blood
2-3 weeks	6	17.0
3-4 weeks	4	15.7
4-5 weeks	6	14.4
5-6 weeks	3	13.7
6-7 weeks	4	12.7
7-8 weeks	4	12.0
2-3 months	6	10.9
3-6 months	19	11.5
6-9 months	16	11.2
9-12 months	6	11.0

weeks of life, that the range of the normal value for hemoglobin is too great for the determination to have any clinical significance. His figures follow in table 4.

Börner,[4] in 1928, made hemoglobin determinations on thirty full-term infants and on five premature infants, from 25 minutes to 15 days old, using an improved Hüfner spectrophotometer, as well as a Bürker hemoglobinometer. He found the range of hemoglobin to be from 23.71 to 15.2 Gm. per hundred cubic centimeters.

3. Drucker, P.: Investigations on the Normal Values for the Haemoglobin and Cell Volume in the Small Child, Acta pædiat. **3**:1, 1923.

4. Börner, R.: Das Blut des Menschen; mit neueren Methoden untersucht: III. Das Blut des Neugeborenen in Bezug auf absoluten Hämoglobingehalt, Arch. f. d. ges. Physiol. **220**:716 (Oct.) 1928.

In the group of artificially fed infants studied by Mackay,[5] in 1931, the observations ranged from three to one hundred and sixteen for each age group cited. The hemoglobin estimations were made by Haldane's method. The standard tube was calibrated so that 100 per cent represented an oxygen-combining power of 18.5 volumes per hundred cubic centimeters, or 13.8 Gm. of hemoglobin per hundred cubic centimeters. The blood was taken from a prick in the heel with a triangular cutting-needle. Mackay's[5] findings are shown in table 5. (The hemoglobin equivalents in grams per hundred cubic centimeters of blood was added by us.)

3. *Reticulocytes.*—There is a considerable discrepancy in the literature as to the number of reticulated cells found in the new-born infant. It would seem that this discrepancy is at least partially accounted for

TABLE 5.—*Mackay's Figures for Hemoglobin in Infants from One Month to One Year of Age*

Age	Number of Observations	Mean Hemoglobin in per Cent	Gm. of Hemoglobin per 100 Cc. Blood
0-1 month	3	105.0	14.5
1-2 months	42	74.8	10.3
2-3 months	99	64.9	9.0
3-4 months	111	66.4	9.2
4-5 months	114	69.4	9.6
5-6 months	116	70.8	9.8
6-7 months	113	69.6	9.6
7-8 months	115	68.7	9.5
8-9 months	100	68.4	9.4
9-10 months	85	67.5	9.3
10-11 months	74	65.9	9.1
11-12 months	66	65.5	9.0

by the method of counting the reticulocytes. Those who report larger figures have probably included in their counts all cells which contain any vestige of reticulum. In our counts, we have included only those cells which have a large amount of well defined reticulum.

Luzzatto and Ravenna[6] reported the findings on eight new-born infants. The highest reticulocyte count was 1.7 per cent in a new-born premature infant of seven months' gestation. The lowest was a count of 0.7 per cent. The remainder of the infants had a count slightly above 1 per cent, the absolute as well as the relative number decreasing to between 0.7 and 0.05 per cent eight days after birth. They stated that the figure of 1 per cent was ten times that of the adult figure,

5. Mackay, H. M. M.: Nutritional Anaemia in Infancy, with Special Reference to Iron Deficiency, Medical Research Council, Special Report Series, 157, London, His Majesty's Stationery Office, 1931.

6. Luzzatto, A. M., and Ravenna, F.: Ueber die Zahl der vitalfärbbaren roten Blutkörperchen unter normalen Verhältnissen und bei anämischen Zuständen, Folia haemat. **13**:102 (April) 1912.

which was from 0.13 to 0.14 per cent. These figures for reticulocytes in adults are lower than those of Mallory and Wright,[7] who give from 0.6 to 1.2 per cent, and of Krumbhaar,[8] who gives 0.3 per cent as an average; he considered counts over 1 or under 0.1 per cent as abnormal. Frank[9] found the reticulated cells of new-born infants to be from 1 to 9 per cent during the first week of life. Seyfarth[10] studied the reticulocytes in twenty normal infants, and found them to be from 5 to 10 per cent a few hours after birth. They sank within six days to anywhere from 0.3 to 1 per cent. Moldawsky,[11] in twenty-two healthy infants from 10 days to 9 months of age, found the reticulocytes varied from 0.1 to 0.5 per cent. He found two instances of counts of 1.3 and 2.3 per cent. Later, Seyfarth and Jurgens[12] reported observations on fifty new-born infants, from one hour to three weeks after birth. At birth, the reticulocytes were 7 per cent; within the first ten days, 2 per cent; within the first three weeks, 0.7 per cent. Krafka[13] expressed the belief that the data of Seyfarth and Jurgens favor the hypothesis that increased oxygenation at birth has an inhibitory influence on erythropoiesis, inducing a subsequent fall in the reticulocyte count.

4. *Platelets.*—The platelet counts of various observers for the new-born infant, and during the first year, are contained in table 6.

5. *Bleeding and Coagulation Time.*—The bleeding and coagulation time of new-born infants as found by various investigators appear in table 7.

II. SCOPE OF STUDY

A series of seventy-three normal full-term infants of mothers with negative Wassermann reactions was selected for study. The infants were born at Sloane Hospital and were followed at frequent intervals throughout the first year of life at the Vanderbilt Clinic.

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7. Mallory, F. B., and Wright, J. H.: Pathological Technique, ed. 8, Philadelphia, W. B. Saunders Company, 1924, p. 469.

8. Krumbhaar, E. B.: Reticulosis: Increased Percentage of Reticulated Erythrocytes in the Peripheral Blood, J. Lab. & Clin. Med. **8**:11 (Oct.) 1922.

9. Frank, M.: Studien über die Frühgeburtenanämie, Monatschr. f. Kinderh. **37**:468 (Dec.) 1927.

10. Seyfarth, C.: Experimentelle und klinische Untersuchungen über die vitalfärbbaren Erythrozyten, Folia haemat. **34**:7 (April) 1927.

11. Moldawsky, J. W.: Die praktische Bedeutung der supravitalen Färbung der roten Blutkörperchen, Jahrb. f. Kinderh. **116**:81 (May) 1927.

12. Seyfarth, C., and Jurgens, R.: Untersuchungen über das Verhalten der vitalgranulierten roten Blutzellen (Retikulocyten) bei Embryonen und Neugeborenen, Virchows Arch. f. path. Anat. **266**:676 (Jan.) 1928.

13. Krafka, J.: Reticulocytes in the Premature and Still-Born, Folia haemat. **43**:318 (Feb.) 1931.

Visits were made at two week intervals up to the age of 2 months, and then every three or four weeks during the remainder of the first year. All clinical observations and management were under the immediate supervision of one of us. The infants were chiefly from the poor or underprivileged classes, although a few were above the status normally encountered at a large metropolitan clinic. The racial types were chiefly American or West Indian Negroes, Italians, Jews, Irish

TABLE 6.—*Platelet Values of Various Investigators for Infants from Birth to One Year of Age*

Author	Maximum	Minimum	Average	Comment
Slawik [25]	616,000	202,000	320,000	Healthy new-born infants at 10 days
Lucas and co-workers [22]	.....	.....	305,000	12 infants, 1st day of life
			300,000	9 infants, 2d day of life
			266,000	5 infants, 8th day of life
Keilmann: Monatschr. f. Kinderh. **23**: 383 (July) 1922	192,000	48,000	.....	55 infants (3 wks. to 12 mos.)
Lippman: Am. J. Child. Dis. **27**: 473 (May) 1924	.....	.....	213,000	41 infants, soon after birth
Emmanuele [26]	460,000	380,000	440,000	15 infants, 1st day of life
	560,000	280,000	430,000	7 infants, 2d day of life
	520,000	340,000	430,000	8 infants, 3d day of life
	520,000	220,000	280,000	3 infants, 4th day of life
	420,000	320,000	350,000	4 infants, 5th day of life
McLean and Caffey [23]	.....	.....	278,000	New-born infants
			359,000	Older infants
von Farnos [24]	200,000	100,000	.....	85 infants, 1st day of life
	270,000	170,000	.....	5th to 7th day
	350,000	250,000	.....	3d week of life
Sanford [33]	.....	.....	250,000	25 infants, birth
			300,000	1st day of life
			280,000	2d day
	320,000	280,000	.....	3d to 10th day
Eckerstrom [32]	227,000	148,000	181,000	15 counts, 1st day of life
	221,000	190,000	201,000	15 counts, 2d day of life
	244,000	186,000	209,000	14 counts, 3d day of life
	265,000	208,000	226,000	18 counts, 4th day of life
	270,000	216,000	237,000	15 counts, 5th day of life
	277,000	238,000	257,000	14 counts, 6th day of life
	450,000	250,000	.....	at 1 year
Jarcho: Arch. Pediat. **47**: 230 (April) 1930	200,000	150,000	.....	100 new-born infants, 24 to 48 hrs. old
Beuhamon and Nouchy [34]	.....	.....	359,000	New-born infants (number not specified)
	400,000	300,000	.....	New-born infants (2 days to 2 yrs. old)

and Scotch. The majority were at least partially breast fed during the neonatal period. Complementary feedings of diluted cow's milk or evaporated milk with sugar were added when necessary. After weaning, which was usually between the fifth and seventh months, the majority received unmodified cow's milk. Cereal was added to the dietary in most instances at the fourth to the fifth month (some occasionally as early as the third month); vegetable purée and egg yolk at the fifth to the sixth month (occasionally at the fourth month). Stewed fruit was given at the sixth to the seventh month; scraped beef

TABLE 7.—*Coagulation and Bleeding Time at Birth as Found by Various Investigators*

Author	Coagulation Time in Minutes			Bleeding Time in Minutes			Comment	Methods	
	Minimum	Maximum	Average	Minimum	Maximum	Average		Coagulation	Bleeding
Rodda: Am. J. Dis. Child **19**: 269 (April) 1920	6	10	7	2	5	3½	126 infants, 1st day of life	Two 1½ inch watch glasses, and a no. 6 lead shot; tilting every 30 sec. until clotting occurred	Duke method
Lucas and co-workers [28]	..	..	15	1½	3	..	.....	2 cc. of blood, obtained by syringe from longitudinal sinus; placed in test tube 21 mm. in diameter; tube allowed to stand for 5 min. before first test made; then rotated every 30 sec. until coagulation occurred	No method given
Falls: J. A. M. A. **79**: 1816 (Nov. 25) 1922	..	..	4½	..	..	..	10 cases	1 cc. blood in test tube, which was tilted every half minute until clotting occurred	
Sherman and Lohnes: New York State J. Med. **23**: 146, 1923	..	..	..	..	..	..	100 infants (12 infants, coagulation time longer than 9 min.; 28 infants, bleeding time not more than 5 min.)	Rodda method	Duke method
Emmanuele [35]	1½	3	2¼	..	..	..	15 cases, 1st day of life	Rodda method with glass bead, instead of lead shot	
	1½	4	2¾	..	..	..	7 cases, 2d day of life		
	1	3	2	..	..	..	8 cases, 3d day of life		
	3	4½	3¾	..	..	..	3 cases, 4th day of life		
	3	4	3½	..	..	..	4 cases, 5th day of life		
Grob: Am. J. Dis. Child. **32**: 200 (Aug.) 1926	..	..	..	..	..	..	68 cases (6 had a prolonged coagulation time; 11 had a prolonged bleeding time; 4 had a prolonged coagulation and bleeding time)	Rodda method	Duke method
Sanford [36]	..	..	..	..	..	..	200 infants (delivered without anesthetic)	Modification of Rudolf's method; about 9 cm. of blood drawn into 2 glass pipets about 1 mm. in diameter, and 18 cm. long; tubes put in incubator at 20 C.; at end of one minute one of tubes removed, small piece broken from end; this was repeated every 30 sec. until thread of fibrin appeared between broken ends; time between puncture and appearance of fibrin taken as coagulation time; second tube used as control	Duke method
			4½			3.0	Birth		
			4			3.0	24 hours old		

and liver at the seventh to the eighth month. Orange juice was given as a routine between the first and third months, and cod liver oil or viosterol, or a combination of the two, chiefly between the first and second months. No iron or copper therapy was given to any infants in this group. Separation of infants into breast-fed and artificially fed groups has not been attempted, since the number of exclusively breast-fed infants was very small. Among the infants of this series, such a division has not seemed to be of any importance. It may be noted that Drucker found no difference in hemoglobin values between artificially fed and breast-fed infants.

Although the infants in this study have been designated as "normal," it is not implied that they did not suffer the common illnesses of infancy. In determining the incidence of illness, an arbitrary rule was adopted of considering the common infections of infancy, such as rhinitis, otitis or intestinal indigestion, as "illnesses" only when they affected the

TABLE 8.—*Morbidity Figures for Infants Reported in This Study*

Type of Infection	Incidence of Infection	Number of Infants Affected
Rhinopharyngitis	32	24
Otitis media	2	2
Bronchitis	3	3
Pneumonia	2	2
Tonsillitis	10	10
Acute intestinal indigestion	8	8
Chickenpox	1	1
Pertussis	1	1

weight curve adversely on one or more clinic visits subsequent to the visit at which the illness was reported. During the interim at home there may have been a slight loss of weight, but this possibility was of necessity overlooked if the loss was more than recovered before the next visit to the clinic, in those not considered to have "illnesses." Under such a ruling, three infants, or 4 per cent, showed during their visits a stationary weight, or a failure to gain.

Table 8 shows the incidence of the various infections in the group of normal infants during their first year. These are not designated as "illnesses" according to the classification which we have specified previously, as they did not affect the weight curve. Of the cases of rhinitis, nineteen infants had one attack, three infants had two attacks, one infant had three attacks, and one infant had four attacks. Only two infants were admitted to the hospital, and in both cases the temperature was high for two days only. There were no deaths during the period of observation.

III. METHODS

Blood samples were obtained by puncturing the infant's toe with a Hagedorn needle. All blood determinations were made by one person

(R. B.), and the same hemocytometer was used for all erythrocyte counts. The diluting fluid was a 3 per cent solution of sodium citrate. The hemoglobin determinations were made by the modified method of Wong,[14] and a Duboscq colorimeter was used. The principle of the Wong [14] method is that iron is detached from the hemoglobin molecule by means of sulphuric acid in the presence of potassium persulphate, without heating. After removal of protein by tungstic acid, iron is determined colorimetrically in the filtrate as thiocyanate. The hemoglobin content of the blood is then calculated from the iron. Karshan and Freeman [15] compared this method with the oxygen capacity method of Van Slyke and Neill and found that it checked very closely.

The platelets were counted by the method of Wood, Vogel and Famulener.[16]

The reticulated cells were vitally stained with brilliant cresyl blue, and were counterstained with Svehla's stain.

The bleeding time was estimated by the method of Duke.[17] The clotting time was determined by the fine capillary tube method.

All data included in this study are recorded in the form of tables and curves. The curves are composed of a mean curve, represented by the solid black line, above and below which the two dotted lines represent the range of the standard deviation.[18] By way of explanation, it may be stated that a distance of one standard deviation from the mean in both directions gives the range within which two thirds of the original observations fall. A detailed table of the figures from which each curve is compiled is appended.

IV. RESULTS AND COMMENT

Chart 1 shows the curve of weight of the group of seventy-three infants and is included as evidence of the normality of the group as a whole. The mean birth weight is 3,510 Gm. and the mean weight at one year is 9,840 Gm.

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14. Wong, S.: Colorimetric Determination of Iron and Hemoglobin in Blood, J. Biol. Chem. **77**:409 (May) 1928.

15. Karshan, M., and Freeman, R. G., Jr.: A Study of Hemoglobin Methods, J. Clin. & Lab. Med. **15**:74 (Oct.) 1929.

16. Wood, F. C.; Vogel, K. M., and Famulener, L. W.: Laboratory Technique, ed. 3, New York, T. Dougherty, 1929, p. 26.

17. Duke, W. W.: The Relation of Blood Platelets to Hemorrhagic Disease, J. A. M. A. **55**:1185 (Oct. 1) 1910.

18. The standard deviation (σ) was calculated from the formula $\sigma = \sqrt{\frac{\Sigma d^2}{N}}$ in which d represents the deviation of each observation from the mean of all observations and N the number of observations.

Chart 2 shows the curve of the erythrocytes through the first year. The mean figure at birth is 5.95 ($\pm$ 0.04)[19] million per cubic millimeter. The number falls rapidly to 4.74 ($\pm$ 0.04) million at the second month, and subsequently exhibits only minor fluctuations. Although the mean curve apparently reaches its lowest level at four months and rises somewhat during the second half year, it can be shown that the variations recorded after the second month are too small to have statistical significance. However, the real difference which is demonstrable between the mean values at one and two months indicates that a period longer than one month is required for initial red cell adjustment.

In chart 3, the erythrocyte findings are represented in another way which permits visualization of the relative frequency of counts of

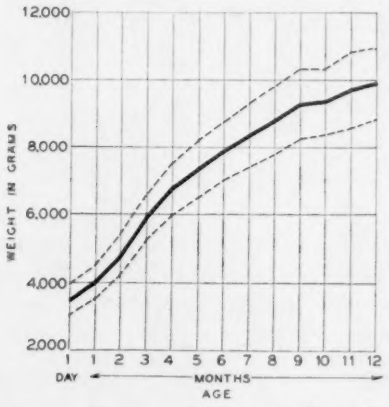

Chart 1.—Weight curve of group of normal infants from birth to one year of life.

magnitudes both close to and removed from the mean values. It also shows the relative distribution of counts of different magnitudes about the most frequent magnitude. This distribution is seen to be roughly in the form of the well known bell-shaped curve to which the statistical formula applied in this analysis is applicable. From the second month on, a plurality if not a majority of values falls in the range

19. The figure following the $\pm$ sign represents the probable error of the mean, and not the standard deviation which is given on the charts. The probable error was calculated from the formula: P. E. $= 0.6745 \times \frac{\sigma}{\sqrt{N}}$. A difference between two mean values (M_1 and M_2) has been regarded as statistically significant only when at least three times greater than the probable error of the difference, computed according to the following formula:

$$\text{P. E. } (M_1 - M_2) = \sqrt{(\text{P. E}_{M1})^2 + (\text{P. E}_{M2})^2}$$

4.5 to 4.9 million; and from the fifth to the eighth month, there is a dispersion of values—which would be expressed graphically by a flattening out of the frequency curves for these months—suggesting a lability of the erythrocyte level under the influence of various environmental factors. It is of interest to compare these figures with the

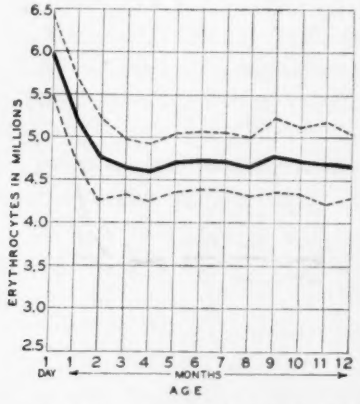

Chart 2.—Curve of erythrocytes of normal infants through the first year.

TABLE 9.—*Erythrocytes in Normal Infants*

Age	Number of Observations	Erythrocytes in Millions			Standard Deviation	Probable Error of the Mean	Coefficient of Variation*
		Minimum	Maximum	Mean			
1st day	73	4.6	6.8	5.95	0.47	0.04	7.9
1 month	68	3.9	5.9	5.19	0.48	0.04	9.2
2 months	60	3.7	5.9	4.74	0.46	0.04	9.7
3 months	59	3.9	5.4	4.65	0.33	0.03	7.1
4 months	58	3.6	5.2	4.61	0.33	0.03	7.2
5 months	53	3.9	5.5	4.67	0.34	0.03	7.3
6 months	45	3.8	5.2	4.73	0.34	0.03	7.4
7 months	38	3.9	5.3	4.70	0.35	0.04	7.5
8 months	33	3.8	5.3	4.65	0.35	0.04	7.5
9 months	20	4.2	6.3	4.79	0.44	0.07	9.2
10 months	20	4.2	5.6	4.74	0.37	0.06	7.8
11 months	16	3.9	5.4	4.70	0.49	0.08	10.4
12 months	15	4.1	5.3	4.67	0.36	0.06	7.7

* The coefficient of variation is the percentage ratio of the standard deviation to the arithmetic mean, and is calculated from the formula $V = 100 \frac{\sigma}{M}$

commonly accepted normal figures for adults. Our erythrocyte findings at birth conform in general with the findings of other observers; they are lower than those of Mayers [20] and Zibordi,[21] but are almost identical

20. Mayers, L. H.: A Study of the Erythrocyte Curve at Various Ages and Its Relationship to Hemoglobin Curve, Arch. Int. Med. **30**:478 (Oct.) 1922.

21. Zibordi, F.: Ematologia Infantile normale e patologica, 1925; quoted from Baar, H., and Stransky, E.: Die klinische Hämatologie des Kindesalters, Leipzig, Franz Deuticke, 1928.

with those of Lucas and co-workers,[22] McLean and Caffey,[23] von Farnos,[24] and Slawik.[25]

Chart 4 shows the curve of hemoglobin throughout the first year. At birth, the mean value is 23.4 (±0.02) Gm. per hundred cubic centimeters. There is a rapid fall through the first two months to 13.1 (±0.1) Gm. at the second month. Although there seems to be a

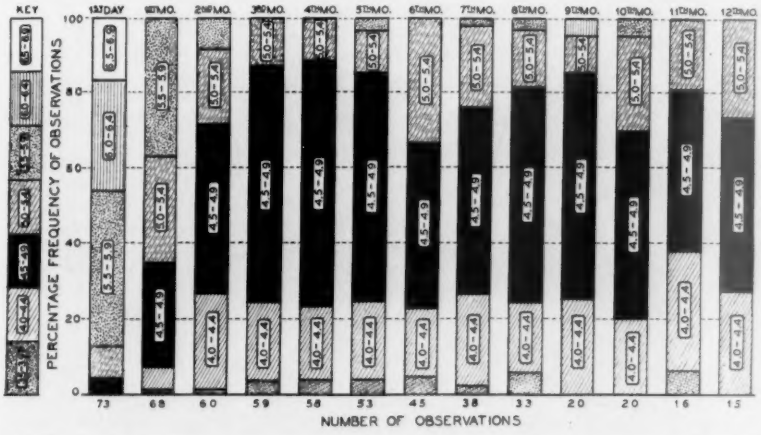

Chart 3.—Percentage frequency of various erythrocyte counts of normal infants through the first year.

TABLE 10.—*Hemoglobin Values of Normal Infants*

Age	Number of Observations	Hemoglobin, Gm. per 100 Cc.			Standard Deviation	Probable Error of the Mean	Coefficient of Variation
		Minimum	Maximum	Mean			
1st day	73	17.0	27.5	23.4	2.3	0.19	10
1 month	68	10.7	22.0	16.4	2.5	0.20	15
2 months	60	10.7	19.0	13.1	1.6	0.14	12
3 months	59	10.0	15.5	12.6	1.1	0.10	9
4 months	58	9.0	15.0	12.8	1.1	0.10	8
5 months	53	9.7	15.8	13.0	1.4	0.13	11
6 months	45	10.0	15.0	13.1	1.2	0.12	9
7 months	38	10.0	15.0	12.9	1.3	0.14	10
8 months	33	9.0	15.8	12.7	1.6	0.19	13
9 months	20	11.0	15.3	12.9	1.3	0.19	10
10 months	19	8.6	15.0	12.9	1.5	0.23	12
11 months	16	7.8	15.0	12.5	1.7	0.28	13
12 months	15	8.5	15.0	12.4	1.7	0.30	14

22. Lucas, W. P.; Dearing, B. F.; Hoobler, H. R.; Cox, A.; Jones, M. R., and Smith, F. S.: Blood Studies in the Newborn, Am. J. Dis. Child. **22**:525 (Dec.) 1921.

23. McLean, S., and Caffey, J. P.: Blood Platelet Counts in Infants and in Young Children, Am. J. Dis. Child. **30**:810 (Dec.) 1925.

24. von Farnos, H.: Das Verhalten der Blutplättchen bei Neugeborenen und ganz jungen Säuglingen, Jahrb. f. Kinderh. **112**:47 (March) 1926.

25. Slawik, E.: Studien über die physiologischen Verhältnisse des Blutes beim Neugeborenen mit besonderer Berücksichtigung der Blutplättchen, Ztschr. f. Kinderh. **25**:212 (June) 1920.

further drop in hemoglobin at the third month, statistically the minor fluctuations throughout the first year after the second month are not significant. Comparison of the curve of hemoglobin with that of the erythrocytes shows that they are practically parallel, in their rapid fall from birth to the second month, and show no significant changes in value throughout the rest of the first year.

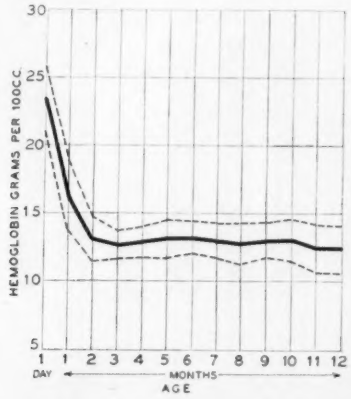

Chart 4.—The curve of hemoglobin of normal infants through the first year.

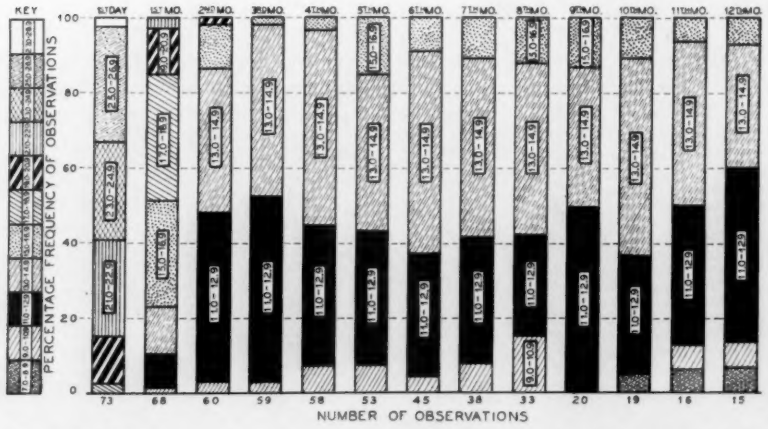

Chart 5.—Percentage frequency of various hemoglobin levels in normal infants through the first year.

Chart 5 shows the percentage frequency of various hemoglobin levels by single months throughout the first year. Beginning with the fourth month, the greater number of cases fall within the range of 13 to 14.9 Gm. per hundred cubic centimeters, with the exception of the ninth and twelfth months, when the greater percentage lies between 11 and 12.9 Gm. per hundred cubic centimeters.

In chart 6, we have superimposed the curves of hemoglobin for the first year of Williamson,[1] Appleton,[2] Drucker,[3] and Mackay [5] and ours. Of these authors, only Williamson,[1] Appleton [2] and we give figures at birth. Williamson's [1] curve of hemoglobin is the highest; it shows a somewhat less rapid fall to the fourth month than ours, but thereafter approximates our curve at a slightly higher level throughout the first year. Mayers,[20] comparing a series of erythrocyte counts during the first year with Williamson's [1] curve of hemoglobin, found that the curves did not run parallel to each other and raised the question whether the "low" hemoglobin values which Williamson [1] found at 1 year of age are to be regarded as strictly "onrmal," or whether they might be altered by a different plan of infant feeding.

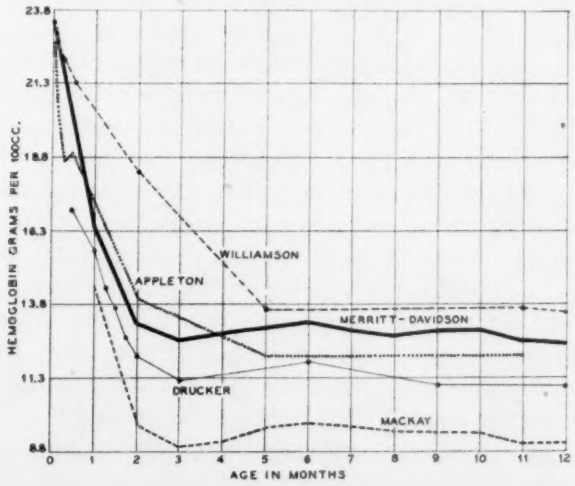

Chart 6.—Comparative hemoglobin curves of several investigators.

In attempting to explain the difference of results obtained by Williamson,[1] Appleton [2] and Drucker,[3] working with English, American and Danish children, Drucker [3] suggested that national peculiarities possibly play a rôle. He expressed the belief that this has been brought out by the different results obtained by Schiff,[26] working in Budapest and in Prague. Schiff [26] used the same apparatus in both cities, but obtained varying figures for the two places. In evaluating this factor in Williamson's [1] and our figures, it is to be remembered that though we call the infants encountered in our clinics "American," we are, in fact, dealing with a mixture of races, and that one seldom finds in our clinics an infant whose ancestors have been in the United

26. Schiff, E.: Neuere Beiträge zur Haematologie der Neugeborenen, Jahrb. f. Kinderh. **54**:172 (Aug.) 1901.

States for more than one generation. Drucker [3] pointed out the striking similarity between his figures and those of Monrad [27] and Ørum,[28] who also reported figures on Danish children. Monrad [27] obtained from 70 to 80 per cent hemoglobin throughout the greater part of childhood, after a sharp fall in the first few weeks of life from 100 to 130 per cent at birth. Ørum [28] investigated sixty-one nonanemic children by Tallqvist's method and obtained mean values of 80 per cent at the ages of 1 month to 6 years. In considering the racial factor, one should also take into consideration the difference in birth weight in various countries. We have compared our weight curve with those given by Robertson,[29] and it is found that the average weight of British infants at birth and at the end of the first year are lower than ours. Robertson [29] brings out the fact, from Bowditch and Pearson's figures, respectively, that the birth weight of American males is 120 Gm. greater than that of English males and that of American females is 75 Gm. greater than that of English females. He also stated that South Australian infants weighed from 240 to 300 Gm. more at birth than infants born in Great Britain. He added "that the evolution of the Australian people may be regarded as that of the British people under changed climatic, social and economic conditions." Mackay [5] gives no weight figures for her infants. She stated that infants of low birth weight (not necessarily premature infants) tend to become anemic, so that if her infants in common with other British infants reported in the literature weighed in general less than our group, this may be a factor in the difference in the blood findings. Our findings in immature infants to be reported later bear out this statement of Mackay's.[5]

Climatic as well as racial differences are probably important factors, though as previously stated, in North America the mixture of races makes evaluation of the factor of race a difficult one. The influence of sunshine should also be considered. There is a markedly greater prevalence of sunshine in New York City than in London, as is shown by Hess [30] in his study of rickets. He stressed the fact that for the year 1923, for instance, there were 2,557 hours of sunshine in New York City, as compared with 1,227 hours of sunshine in London. This prevalence of sunshine, coupled with the fact that American mothers are constantly urged to take even very young infants out of doors and to expose them to direct sunlight without clothes, may influence the

27. Monrad, S., quoted from Drucker.[3]

28. Ørum, H. P. T.: Anämi hos børn, Bibliot. f. læger **107**:189 (May) 1915; quoted from Drucker.[3]

29. Robertson, T. B.: Growth and Development, in Abt, I. A.: Pediatrics, Philadelphia, W. B. Saunders Company, 1923, vol. 1, p. 474.

30. Hess, A. F.: Rickets, Including Osteomalacia and Tetany, Philadelphia, Lea & Febiger, 1929, p. 112.

curve of hemoglobin. We can offer no evidence for the effect of sunshine on the hemoglobin level, and merely suggest this as a hypothesis which may partially explain the difference in our figures for infants of New York City as compared with Mackay's [5] group of infants of London.

The effect of diet is difficult to evaluate. Mackay [5] apparently feels that the factor of breast feeding is important, since she groups her infants into those who were breast fed and those who were artificially fed. A great majority of our infants had complementary feedings at the second to the third month of age, and rapidly thereafter ceased to be breast fed, owing to inadequate breast milk, so that a comparison of our hemoglobin curve with Mackay's [5] curve for artificially fed infants is of interest. The lowest point in Mackay's [5] curve for artificially fed infants is 8.9 Gm. (expressed by her as 64.9 per cent) as compared with 12.6 Gm. in our group at the same age period. At the outset of this study, it was our opinion that the hemoglobin curve of normal American infants would be higher than Mackay's [5] on account of our practice of feeding iron-rich foods earlier than was done in her series. By 8 months of age, practically all of our infants had been on foods rich in iron (egg yolk, vegetables and fruits) for several months. Mackay's [5] infants were on an exclusive milk diet until 8 months of age, at which time they were put on a mixed diet. She asserted that she had had no experience of early dietetic treatment, but thought it possible that yolk of egg introduced into the diet at 2 months of age would be effectual, saying: "It is possible that we habitually start mixed feeding too late, and that infants should normally partake of mixed feeding as well as breast milk before five months old, but the effect of such a course can only be determined by trial." As the low point in our hemoglobin curve comes at the third month before our infants received iron-rich food, it would seem that other than dietary factors must be the important ones.

The literature shows a considerable divergence of opinion as to what are normal values for hemoglobin during the first year of life. There are several factors which partially account for this diversity. First, the technic used in procuring the blood. Drucker [3] and Mackay [5] have both shown that blood obtained from the ear and the heel differ as much as from 1 to 23 per cent, averaging 10.3 per cent higher in the ear. Second, the standard tubes used in colorimetric estimations differ considerably, and, also, the tubes may change color with time. Williamson's [1] figures for hemoglobin values, which are frequently quoted, are higher than any others, and Drucker [3] suggested the possibility of a technical oversight in his standardization.

Mackay [5] constructed a so-called "standard normal hemoglobin curve" for infants throughout the first year (excluding values at birth). This chart was constructed from groups of untreated normal breast-fed infants throughout the early months of life, but contained figures for iron-treated infants at 3 to 5 months of age. After five months, she assumed that the value is the same throughout the rest of the first year. This curve drops from about 98 per cent (13.5 Gm. per hundred cubic centimeters) between birth and the first month to below 70 per cent (9.7 Gm. per hundred cubic centimeters) at about the second month, then rises to 80 per cent (11 Gm. per hundred cubic centimeters) between the fifth and sixth month, where it remains throughout the first year. Mackay [5] stated "that if a drop of 10 per cent below our normal standard hemoglobin indicates definite anemia, then under twelve months of age, 45 per cent of breast-fed, and 51 per cent of artificially fed infants in our series showed these subnormal values when examined." Mackay's [5] curve in chart 6 representing her series of artificially fed infants shows an initial drop in hemoglobin to 64.9 per cent (8.9 Gm. per hundred cubic centimeters) which is greater than that in her theoretical standard hemoglobin curve (69 per cent [9.5 Gm. per hundred cubic centimeters]). It is to be regretted that her curve did not include figures at birth, since in other respects this curve and our curve are strikingly parallel. However, from the second month throughout the remainder of the first year the curve of our figures is higher than hers by approximately 4 Gm. of hemoglobin per hundred cubic centimeters. Mackay [5] quoted Schwartz and Rosenthal [31] as saying that they had no difficulty in collecting forty cases of well marked anemia in a few months in New York City, from which she concluded that "slight cases must have been extremely common in that city." In any large clinic, it would not be difficult at any time to collect many cases of well marked anemia, but it does not seem fair to conclude that anemia is the rule rather than the exception among normal infants in New York City.

Chart 7 shows the curve of the reticulocytes throughout the first year. There is a rapid fall of the reticulocytes through the first seven days from a value of 3.4 ($\pm$ 0.06) per cent at birth to 0.17 ($\pm$ 0.01) per cent at one week. While from this point on, the curve apparently shows little variation, it can be shown statistically that there is a significant fall between one week and one month. It can be shown also that there is a slight increase in reticulocytes throughout the remainder of the first year, with high values at the sixth and tenth months. In

31. Schwartz, H., and Rosenthal, N.: The Chlorotic Type of Anemia in Infants and Children, Arch. Pediat. **37**:1 (Jan.) 1920.

comparing our figures with those in the literature, it will be seen that at birth they are considerably lower than those of most investigators.

Chart 8 gives the curve of platelets in normal infants throughout the first year. From a mean value at birth of 227 (± 3.0) thousand, there is a gradual rise to 348 (± 6.0) thousand at the third month. Although after the third month the curve seems to fluctuate, this is

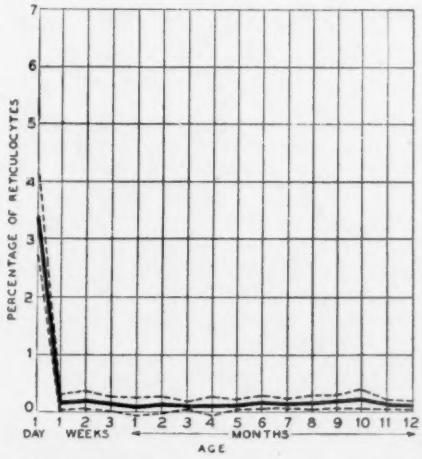

Chart 7.—Curve of reticulocytes of normal infants throughout the first year.

TABLE 11.—*Reticulocyte Values of Normal Infants*

Age	Number of Observations	Reticulocytes, Percentage			Standard Deviation	Probable Error of the Mean	Coefficient of Variation
		Minimum	Maximum	Mean			
Birth	73	1.8	5.50	3.40	0.70	0.06	21
1 week	67	0.04	0.70	0.17	0.14	0.01	82
2 weeks	19	0.05	0.60	0.21	0.15	0.02	71
3 weeks	22	0.04	0.60	0.14	0.12	0.02	86
1 month	49	0.04	1.20	0.10	0.17	0.02	170
2 months	60	0.04	1.20	0.14	0.16	0.01	114
3 months	56	0.04	0.30	0.12	0.08	0.01	67
4 months	56	0.04	0.30	0.10	0.19	0.02	190
5 months	51	0.04	0.40	0.12	0.10	0.01	83
6 months	47	0.04	0.50	0.18	0.12	0.01	67
7 months	36	0.04	0.50	0.12	0.10	0.01	83
8 months	30	0.04	0.40	0.15	0.12	0.01	80
9 months	20	0.04	0.40	0.18	0.12	0.02	67
10 months	22	0.04	0.70	0.21	0.18	0.03	86
11 months	14	0.04	0.40	0.13	0.10	0.02	77
12 months	15	0.04	0.30	0.11	0.08	0.01	73

not actually significant, and the value throughout the remainder of the first year is practically constant. The figures at birth are somewhat higher than those of von Farnos [24] and Eckerstrom,[32] but definitely lower than those of Slawik,[25] Lucas and co-workers,[22] Sanford,[33] and

32. Eckerstrom, S.: Du nombre des thrombocytes chez les nourrissons normaux, Nourrisson **18**:26 (Jan.) 1930.

33. Sanford, H. N.: Effect of Ultraviolet Light on the Blood of New-Born Infants, Am. J. Dis. Child. **33**:50 (Jan.) 1927.

Beuhamon and Nouchy.[34] The literature shows few figures after the neonatal period of two weeks. After the third month, our figures agree with those of McLean and Caffey [23] and Eckerstrom.[32] It is interesting that two studies from the same clinic (McLean and Caffey [23] and ours), both done by the same technic, agree quite closely, although not done by the same technicians. It suggests that differences in technic

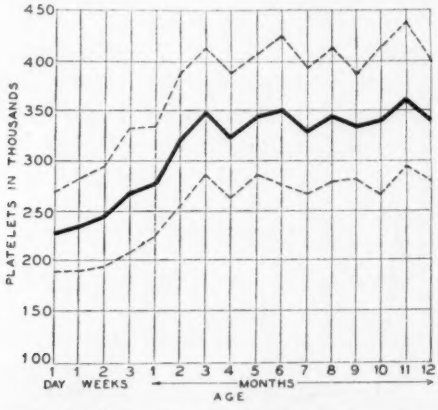

Chart 8.—Curve of platelets of normal infants throughout the first year.

TABLE 12.—*Platelets in Normal Infants*

Age	Number of Observations	Platelets in Thousands			Standard Deviation	Probable Error of the Mean	Coefficient of Variation
		Minimum	Maximum	Mean			
Birth	73	140	290	227	39	3	17
1 week	69	160	320	233	45	4	19
2 weeks	19	170	370	242	50	8	21
3 weeks	23	160	380	269	62	9	23
1 month	48	200	370	277	51	5	18
2 months	59	200	470	320	67	6	21
3 months	58	200	480	348	64	6	18
4 months	56	180	450	324	62	6	19
5 months	51	200	470	345	60	6	17
6 months	47	200	480	350	74	7	21
7 months	34	200	460	330	64	7	19
8 months	28	220	480	346	67	9	19
9 months	19	200	440	333	54	8	16
10 months	23	200	450	340	75	10	22
11 months	15	220	480	361	69	12	19
12 months	15	250	470	339	60	11	18

probably account for the discrepancies found in comparing our figures with those of other investigators.

Bleeding and coagulation time were studied only at birth. One observation was made on each infant during the first twenty-four hours of life. Chart 9 shows the frequency curves of bleeding and coagulation time. It will be seen that the great majority of infants showed

34. Beuhamon, E., and Nouchy, A.: Les plaquettes sanguines chez le nouveauné, etc., Compt. rend. Soc. d. biol. **107**:171 (May) 1931.

a bleeding time of one-half minute to two and one-half minutes, and a coagulation time of two to four minutes. A comparison of our figures is possible only with those of Lucas and co-workers,[22] Emmanuele [35] and Sanford,[36] as they are the only ones who state that figures were obtained on the day of birth. Lucas and co-workers [22] give an average of fifteen minutes for the coagulation time on the day of birth. This is strikingly higher than that of any other observer, but as Lucas used blood from the longitudinal sinus, his figures are not comparable with those of other investigators. Also, 2 cc. of blood were used, and the tube was 21 mm. in diameter. His bleeding time of one and a half minutes to three minutes more nearly conforms to our figures. Emmanuele [35] gives a mean value of two and a quarter minutes for the

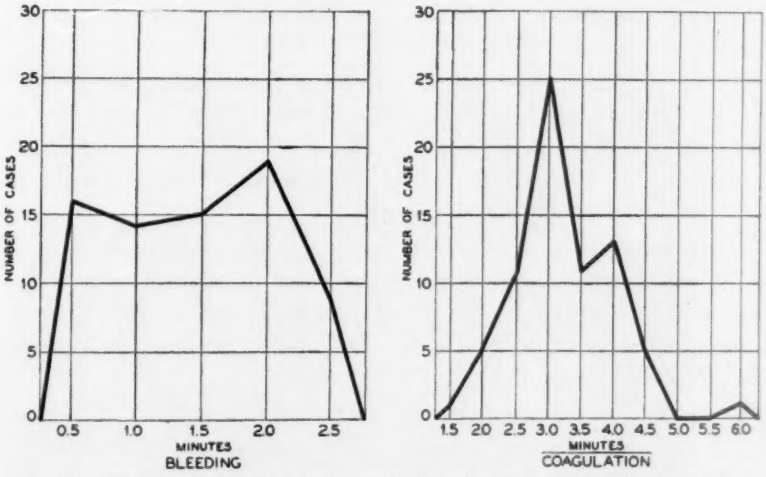

Chart 9.—Curves of bleeding and coagulation time in normal infants at birth.

coagulation time of infants on the first day of life, which agrees fairly closely with our figures. Sanford's [36] figures of three minutes for bleeding time and four and a half minutes for coagulation time are slightly higher than ours.

V. SUMMARY

1. A group of normal American infants have been studied with reference to the behavior of their erythrocytes, hemoglobin, reticulocytes and platelets throughout the first year, also the bleeding and coagulation time on the day of birth.

35. Emmanuele, A.: Ricerche sulle piastrine e sulla coagulabilita del sangue nel neonato, Pediatria **31**:422 (April) 1923.

36. Sanford, H. N.: The Effect of Gas Anesthetics Used in Labor on the Bleeding and Coagulation Time of the Newborn, Anesth. & Analg. **5**:216 (Aug.) 1926.

2. It is apparent that after a period of initial erythrocyte adjustment of two months' duration a mean value of 4.69 million, with a standard deviation of 0.37 million, may be considered as "normal" throughout the first year.[37] After a similar initial period of adjustment, lasting two months, the mean value for hemoglobin for the first year is 12.6 Gm. per hundred cubic centimeters, with a standard deviation of 1.36 Gm. From these figures, it would appear that normal infants in New York City do not become anemic, as Mackay [5] stated was the case in 51 per cent of artificially fed infants in London. It would seem that her "standard normal hemoglobin curve" is below what may be considered as "normal" in this country. In using Haden's scale of 15.6 Gm. per hundred cubic centimeters, which is equivalent to 100 per cent, the color index is found to be 0.86. With Sahli's scale, 17 Gm. per hundred cubic centimeters is equivalent to 100 per cent, and the color index is therefore 0.90.

3. The reticulocytes in the normal infant are found to have a mean value of 3.4 per cent at birth. After a rapid drop through the first month, they reach a mean value of 0.16 per cent, with a standard deviation of 0.12 per cent, which is considered normal throughout the first year.

4. Blood platelets at birth are found to have a mean value of 227 ($\pm$ 3.0) thousand. After a rise at the third month, their mean value throughout the remainder of the first year is 344 thousand, with a standard deviation of 66 thousand. The figures at birth are lower than those of other investigators, and rise less rapidly.

5. Values for the bleeding time at birth are found to be from one-half to two and one-half minutes. The coagulation time at birth is from two to four minutes.

NOTE.—Since this article was accepted for publication, Mackey [38] has published an article, "The Normal Hemoglobin Level During the First Year of Life—Revised Figures," in which it was stated that owing to necessary restandardization of her hemoglobin apparatus, it is necessary to add 7 per cent to each value quoted in her monograph (1931).

37. The mean value is derived from an average of the arithmetical means for the various months of the first year, from a point beyond which it has been shown that there is no significant variation, according to the formula $M_{(group)} = \frac{\Sigma N_a}{\Sigma N_a M_a}$ The figure for the standard deviation for the first year is computed according to the formula $S.D._{(group)} = \sqrt{\frac{\Sigma (S.D._a \times Na)}{\Sigma Na}}$

38. Mackay, H. M. M.: Arch. Dis. Child. **8**:221 (June) 1933.

EFFECTIVE TREATMENT OF GRIP IN INFANTS AND IN YOUNG CHILDREN

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The task of subduing the grip among babies and children gives rise to great difficulties in both clinical and private cases. At the time of a grip endemic the aim of the physician is to discover a ready and effective medicine. My co-workers and I tried quinine, salicylic acid and a brand of amidopyrine and combinations of these in the usual dosage used during epidemics in our clinic, but without especially favorable results. Before arriving at the mode of treatment described here we experimented with the mixture of quinine, salicylic acid and acetphenetidin (10 Gm.) recommended by G. Mally. The doses were larger than usual, but the results were not satisfactory, for we had difficulty in administering the medicine to infants and noted subsequent loss of appetite, while in older children the quinine caused buzzing in the ears, and lassitude and general discomfort followed.

As this treatment did not have the desired result during the epidemic of 1931 at Pécs, a new method was introduced into the clinic. Consideration of our own and other persons' observations has disclosed that the medicine administered was most effective (1) when it contained amidopyrine or derivatives of amidopyrine, and (2) when larger doses than usual for babies and young children were given. This experience induced us to administer the amidopyrine in an unadulterated form, not in the usual small doses but unhesitatingly in large quantities according to a special method, which up to the present has given the best results.

The amidopyrine was prescribed in the following dosage day and night until the temperature reached normal: from birth to 1 month of age, 0.05 Gm.; from 3 to 6 months, 0.1 Gm.; from 6 to 12 months, 0.15 Gm., and from 2 to 5 years, 0.2 Gm. As a rule, the fever began gradually to decrease after the third or fourth dose, unaccompanied by any unpleasant symptoms. As soon as the temperture had fallen below 37 C. (98.6 F.), and had remained at this point for at least half a day, the intervals between the doses were lengthened to three hours, and if fever remained absent, to four hours; later it was sufficient to administer the amidopyrine three times daily. If the temperature again rose, the intervals between the doses were increased, this variation in interval continuing as long as necessary. The amidopyrine was prescribed in a 3 to

4 per cent solution, to be taken in a concentrated syrup. The daily doses were much larger than usual; e. g., an 8 month old infant received 0.15 Gm. of amidopyrine per dose and 1.5 Gm. per day. By this means we reached, sufficiently rapidly, and maintained an effective concentration of amidopyrine in the organism. This is necessary because in the second stage of grip there is usually an exacerbation (Noeggerath). To stop the medicine too soon or too suddenly is an error; the diminishing of the concentration of amidopyrine demands great care or the drug does not have its full effect.

When this new method of treatment, which employs unusually large doses, is introduced the following questions must be answered:

1. Is there any advantage in giving large doses of amidopyrine?
2. Have such large doses any harmful effect?
3. In what way does amidopyrine affect the disease?

The treatment was tried in more than one hundred cases. In order to judge the results correctly, we divided the cases into three groups: The first comprised cases which showed sudden and severe symptoms, high fever and occasional delirium, but in which treatment was given early; the second group, cases of relapse, retarded or chronic development, in which treatment was begun too late; the third group, cases which were complicated by pneumonia, otitis, empyema or sepsis.

The most satisfying results were obtained among patients in the first group. These were chiefly children of well situated families, who called the doctor immediately, and also included children in whom the symptoms developed so rapidly that their parents brought them to the clinic at once. In these patients, after the introduction of the treatment, the fever generally diminished gradually in from twelve to twenty-four hours; in most cases the great exhaustion and weakness as well as occasional delirium were checked. On the second or third day the patient was lively, noticed his surroundings, played and ate with a better appetite and the serious symptoms developed into those of catarrh. The result of this treatment depends greatly on the time that the treatment is started. Most of the good results are obtained in cases in which treatment is given immediately.

To the second group belong cases of longer duration or relapse or in which treatment has been neglected. Simple cases of grip followed the usual course except that it was prolonged, because in cases which have become chronic or in which treatment is instituted too late, the symptoms are much more difficult to overcome than in early cases. With these patients great care must be taken in the treatment, as the symptoms may reappear if the medicine is discontinued too soon.

To the third group belong those cases in which the treatment was begun when the disease was in an advanced stage or sepsis had devel-

oped. In such cases in which sepsis has developed or pus is forming (meningitis, empyema), the treatment cannot be so successfully employed. Cases of this series in which sepsis was developing were hopeless in spite of every form of treatment (transfusion, etc.).

We obtained better results in treating grip and pneumonia or otitis. We administered as much amidopyrine continuously as was sufficient to keep the temperature normal or at least between 37.1 and 37.5 C. (98.8 and 99.5 F.). The reduction of fever in cases of pneumonia has already been recommended by Engel. I go still further, in proposing to treat grip and pneumonia by keeping the patient's temperature normal. I do not pretend that amidopyrine has a special effect on pneumonia or that it shortens the process of the disease. I recommend it, however, for the following reasons: 1. Without fever the children have a better appetite, absorb more nourishment, are quieter and have a slower pulse rate and calmer breathing. The alarming appearance of the disease changes, and in relation to the extensive process in the lungs the general condition of the child frequently is unexpectedly good. 2. This treatment is a great aid in prognosis. When a sufficiently large dose of amidopyrine has been given to keep the patient feverless, and yet the fever is not reduced and even rises, the case is serious or complicated and often hopeless. Usually failure to reduce the fever is a sign of complications (reduction of fever, however, is not always a good sign).

The question as to whether or not large doses of amidopyrine should be given can therefore be answered affirmatively. At the same time I call attention to the fact that the amounts generally prescribed are below the effective dosage of antipyretics, and I trust that I have succeeded in proving the necessity of larger doses than those usually prescribed for infants.

The next question is: Have such large doses of amidopyrine any harmful effect? According to Hefter, amidopyrine in toxic doses causes listlessness, salivation, vomiting, accelerated breathing, irritation of the central nervous system and epileptic cramps in the limbs followed by lameness similar to that caused by curare. A slight amount of salivation and vomiting appears on rare occasions, the latter usually occurring in older infants who object to the bitter taste of the medicine. The vomiting is therefore more the result of neuropathy than a toxic effect of amidopyrine. In such cases the same amount of amidopyrine can be given in the form of powder, in highly concentrated syrup or in a tasteless combination of amidopyrine and tannin, without any unpleasant effects. I have never noticed any signs of collapse in babies after these large doses; the reduction of temperature is sometimes accompanied by perspiration. Much greater care must be taken with older children and with those infected with tuberculosis, who are less able to tolerate larger

doses than infants are. Our experience has been that effective doses for older children are sometimes the same as those for infants, and in cases of tuberculosis are sometimes smaller. These children seldom have a temperature below 36 C. (96.8 F.), when it is necessary to apply warmth.

Apparently children suffering from tuberculosis are much more sensitive than others to the effects of amidopyrine. Mayerhofer has demonstrated that the fever of tuberculous patients is much more easily influenced than fever arising from other causes, and to this observation he attaches diagnostic meaning. The conclusion is drawn that more care must be taken in administering the medicine to tuberculous children.

In the present series of cases the blood showed no harmful effect, anemia did not develop and there was no bleeding of the kidneys or renal pelvis. The urine was often red, a change caused by a decomposition product of amidopyrine. The parents' attention must be called to this fact, as the resemblance to bloody urine may cause them alarm.

Autopsies on children who died after a longer illness during which large amounts of amidopyrine were taken have never disclosed any organs harmfully affected by the drug.

The third question is: In what way does amidopyrine affect the disease? It is almost certain that amidopyrine not only has an antipyretic effect but plays another rôle in the cure. According to Gessler, the antipyretic effect of amidopyrine is a reduction not of heat but of the power of forming heat. The drug diminishes the metabolism in fever, and reduces the pathologic destruction of albumin. It is therefore clear that patients treated with amidopyrine lose less weight and remain in a better condition than those treated by other methods. Korányi-Winternitz stated that amidopyrine has an effect on inflammation, and according to Ferenc it affects anaphylaxis. It is therefore easy to understand that the effective concentration of amidopyrine in the organism can work against the development of the disease.

SUMMARY

1. In my experience amidopyrine, when given in large doses (from 0.10 to 0.15 Gm.), is an effective medicine for grip.

2. No harmful effect has been noted, even in cases of delayed treatment.

3. When substantial doses of amidopyrine were given to infants they bore the illness much better, they lost less weight, their appetite improved and fever and other symptoms diminished or disappeared.

4. In cases in which the fever is not reduced or in which the temperature rises again in spite of amidopyrine, one must be prepared for complications.

CHANGES IN COMPOSITION OF FLUIDS INJECTED INTO THE PERITONEAL CAVITY

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The injection of various isotonic solutions into extracellular spaces has been practiced for years. The mechanism of the absorption of fluids from the peritoneum has been studied in considerable detail by physiologists. This work establishes the fact that the peritoneum acts like a semipermeable membrane which allows fluid in the peritoneum to come into osmotic equilibrium with blood plasma. However, previous work has not determined how far changes in the concentration of the individual ions takes place in establishing equilibrium between a fluid in the abdominal cavity and blood plasma. Osmotic effects have usually been spoken of in terms of total osmotic pressure, whereas interstitial or peritoneal fluid is in an equilibrium with cellular fluid and blood plasma which is expressed in a delicate balance with each ion fixed within a fairly narrow range of concentration. The following work was undertaken to study the changes taking place in individual ions when fluid is placed in the peritoneum. It is hoped that it will help explain some of the local and general effect of intraperitoneal therapeutic procedures, and define the kinds of solutions that may be used for this purpose. While the peritoneal cavity was the site of all injections, the general conclusions probably apply to hypodermoclyses as well.

REVIEW OF THE LITERATURE

In 1926, Cunningham [1] reviewed the literature on the physiology of serous membranes, and only pertinent references need be mentioned

From the Department of Pediatrics, Yale University School of Medicine.

Part of the data are taken from the thesis of A. J. Schechter submitted in partial fulfilment of the requirements for the degree of Doctor of Medicine at Yale University in June, 1931. The thesis was published in part in the Yale Journal of Biology and Medicine (**4**:167, 1931).

1. Cunningham, R. S.: The Physiology of the Serous Membranes, Physiol. Rev. **6**:242, 1926.

here. Starling and Tubby [2] showed that fluids are absorbed from the peritoneum by way of the blood vessels rather than the lymphatics. This observation was confirmed by Heidenhain [3] and others. Dandy and Rowntree [4] demonstrated that phenolphthalein injected into the peritoneal cavity appeared in blood and urine before it could be detected in the lymph of the thoracic duct, and, furthermore, that the output in the urine greatly exceeded that of the thoracic duct. Shipley and Cunningham [5] demonstrated that the omentum withdrawn from the peritoneum and placed in solutions absorbed fluids directly into the blood stream.

Orlow [6] studied the absorption of hypotonic, hypertonic and isotonic solutions placed in the peritoneal cavity. He concluded that osmotic equilibrium was set up and then absorption took place by physiologic activity. Similar conclusions were reached by Leathes and Starling,[7] Fleischer and Loeb,[8] Clark [9] and Putnam.[10] All these observations indicate that the peritoneum acts like a semipermeable membrane, in which fluids come into equilibrium with blood plasma. Clark [9] established that 0.9 per cent sodium chloride decreases to about 0.6 per cent while being absorbed from the peritoneum. However, simultaneous determinations of the various ions have not been made, so that it is not clear to what extent complete ionic equilibrium is established. The absorption of fluid in equilibrium with plasma is presumably dependent on the colloidal osmotic pressure of the blood plasma, perhaps aided by abdominal pressure.

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2. Starling, E. H., and Tubby, A. H.: On the Paths of Absorption from the Peritoneal Cavity, J. Physiol. **16**:140, 1894.

3. Heidenhain, R.: Bemerkungen und Versuche betreffs der Resorption im der Bauchhöhle, Arch. f. d. ges. Physiol. **62**:320, 1895.

4. Dandy, W. E., and Rowntree, L. G.: Peritoneal Absorption with Reference to Postural Treatment, Ann. Surg. **59**:587, 1914.

5. Shipley, P. G., and Cunningham, R. S.: Studies on Absorption from Serous Cavities: I. The Omentum as a Factor in the Absorption from the Peritoneal Cavity, Am. J. Physiol. **40**:75, 1916.

6. Orlow, W. N.: Einige Versuche über die Resorption in der Bauchhöhle, Arch. f. d. ges. Physiol. **59**:170, 1894.

7. Leathes, J. B., and Starling, E. H.: On the Absorption of Salt Solutions from the Pleural Cavities, J. Physiol. **18**:106, 1895.

8. Fleischer, M. S., and Loeb, L.: Studies in Edema: I. Comparative Investigation into the Action of Calcium Chloride and Sodium Chloride on the Production of Urine, Intestinal Fluid and Ascites, J. Exper. Med. **11**:291, 1909.

9. Clark, A. J.: Absorption from the Peritoneal Cavity, J. Pharmacol. & Exper. Therap. **16**:415, 1921.

10. Putnam, T. J.: The Living Peritoneum as a Dialyzing Membrane, Am. J. Physiol. **63**:548, 1923.

The idea of stomas in the peritoneum through which particles could pass (von Recklinghausen [11]) has been abandoned. Cunningham [12] has demonstrated that particles can pass through the cells themselves, and he believes that this is the more usual route, although MacCallum [13] thought that he could demonstrate passage of particles between cells.

When the protein osmotic pressure of peritoneal fluid equals that of blood plasma, absorption takes place, but the exact mechanism is obscure. Landsberg [14] demonstrated cleavage of proteins by enzymic activity in the pleura, but how great a rôle such a mechanism plays in the absorption of fluids in the peritoneum is not clear. Cunningham thought that the mechanical factors accompanying the respiratory movements would have a pumping action that promotes the absorption of abdominal fluid.

The studies reported in this paper are concerned largely with the changes in composition of various fluids injected into the peritoneal cavity. The following isotonic fluids have been used: (*a*) 0.9 per cent sodium chloride; (*b*) a mixture of sodium chloride, sodium bicarbonate and potassium chloride (Cunningham and Darrow [15]), which resembles interstitial fluid; (*c*) Hartmann's [16] solution of sodium chloride, sodium lactate, calcium chloride and potassium chloride, and (*d*) 5 per cent dextrose solution.

Two types of experiments were performed: (1) Fluid was injected into the peritoneal cavity of dogs and portions removed at varying intervals for chemical analysis; (2) fluid was injected into guinea-pigs, and they were killed at varying intervals, allowing an estimation of the total amount of fluid and the concentration of nitrogen, chloride and total base.

METHODS

1. About 360 milliliters of the fluid to be studied was injected into the peritoneal cavity of dogs weighing about 9 Kg. Samples of venous blood and peritoneal fluid were withdrawn under oil and handled so as to prevent the loss of carbon dioxide.

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11. von Recklinghausen, F. T.: Die Lymphgefässe und ihre Beziehung zum Bindegewebe, Berlin, A. Hirschwald, 1862.

12. Cunningham, R. S.: Studies in Absorption from Serous Cavities: IV. On the Passage of Blood Cells and Granules of Different Sizes Through the Walls of the Lymphatics in the Diaphragm, Am. J. Physiol. **62**:248, 1922.

13. MacCallum, W. G.: On the Mechanism of Absorption of Granular Materials from the Peritoneum, Bull. Johns Hopkins Hosp. **14**:105, 1903.

14. Landsberg, M.: Chemistry of Pleural Effusions, Wien. Arch. f. inn. Med. **2**:467, 1921.

15. Cunningham, R. D. M., and Darrow, D. C.: Preparation of a Solution of Sodium Bicarbonate and Sodium Chloride for Hypodermoclysis, Am. J. Dis. Child. **41**:1347 (June) 1931.

16. Hartmann, A. F., in Marriott, W. McK.: Infant Nutrition, St. Louis, C. V. Mosby Company, 1930, p. 323.

2. Twenty-five milliliters of fluid was injected into the peritoneal cavity of guinea-pigs weighing about 500 Gm. The animals were killed with chloroform after varying intervals, and the peritoneal fluid was removed. It was found that by allowing the intestines to hang over a funnel a satisfactory recovery of fluid from the peritoneal cavity could be obtained. This fact was proved by injecting fluid into dead animals and then recovering the fluid by this technic; a loss of from 0.7 to 2 milliliters out of 25 milliliters was demonstrated. A correction of 1.2 milliliters was added to the volume recovered in order to estimate the actual amount of fluid present in the peritoneum.

The following chemical methods were used: carbon dioxide, Van Slyke and Neill;[17] chloride, Van Slyke;[18] total nitrogen, macro-Kjeldahl, except when the quantities of nitrogen were too small, when nesslerization was used; total base, Stadie and Ross's[19] modification of Fiske's method; calcium, Clark and Collip's[20] modification of Kramer and Tisdall's method; sodium, Barber and Kolthoff;[21] potassium, Shohl and Bennett;[22] nonprotein nitrogen, Folin and Wu;[23] phosphate, Benedict and Theis;[24] p_H, colorimetric method of Hastings and Sendroy.[25]

The concentrations are expressed in milliequivalents per liter in the case of peritoneal fluids, and milliequivalents per kilogram of water in the case of serum. The concentration of water in serum was calculated by the formula of Van Slyke, Wu and McLean. The details of calculation are given in a previous paper.[26]

EXPERIMENTAL RESULTS

Changes in Electrolyte Concentration of Fluid Injected into the Peritoneal Cavity of Dogs.—The results can best be studied in graphic presentation. It does not seem necessary to include all the data. In

17. Van Slyke, D. D., and Neill, J. M.: The Determination of Gases in the Blood and Other Solutions by Vacuum Extraction and Manometric Measurement, J. Biol. Chem. **61**:523, 1924.

18. Van Slyke, D. D.: The Determination of Chlorides in Blood and Tissues, J. Biol. Chem. **58**:523, 1923.

19. Stadie, W. C., and Ross, E. C.: A Micro Method for the Determination of Base in Blood and Serum and Other Biological Materials, J. Biol. Chem. **65**: 735, 1925.

20. Clark, E. P., and Collip, J. B.: A Study of the Tisdall Method for the Determination of Blood Serum Calcium with a Suggested Modification, J. Biol. Chem. **63**:461, 1925.

21. Barber, H. H., and Kolthoff, J. M.: A Specific Reagent for Rapid Gravimetric Determination of Sodium, J. Am. Chem. Soc. **50**:1625, 1928.

22. Shohl, A. T., and Bennett, H. B.: A Micro Method for the Determination of Potassium as Iodoplatinate, J. Biol. Chem. **78**:643, 1928.

23. Folin, O., and Wu, H.: A System of Blood Analysis, J. Biol. Chem. **38**:81, 1919.

24. Benedict, S. R., and Theis, R. C.: A Modification of the Molybdic Method for Determination of Inorganic Phosphorus in Serum, J. Biol. Chem. **61**:63, 1924.

25. Hastings, A. B., and Sendroy, J., Jr.: Studies of Acidosis: XX. The Colorimetric Determination of Blood p_H at Body Temperature Without Buffer Standards, J. Biol. Chem. **61**:695, 1924.

26. Darrow, D. C.; Hopper, E. B., and Cary, M. K.: Plasmapheresis Edema: II. The Effect of the Reduction of Serum Protein on the Electrolyte Pattern and Calcium Concentration, J. Clin. Investigation **11**:701, 1932.

each case the experiments were repeated two or more times, and the results presented are typical and not contradicted in other experiments.

Chart 1 shows the changes which take place after the injection of 0.9 per cent sodium chloride solution into the peritoneal cavity. While the total base remains constant, bicarbonate appears in the fluid and chloride decreases. The decrease in chloride is somewhat more rapid than the increase in bicarbonate, so that some acid ions which were not determined entered the fluid. The increase in nitrogen is fairly constant and presumably represents a small amount of protein which appears

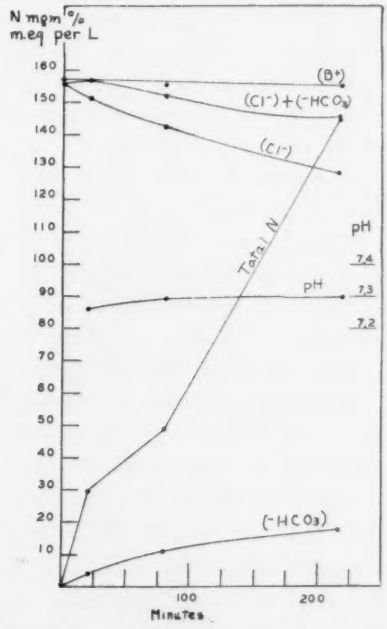

Chart 1.—Changes occurring in the composition of physiologic solution of sodium chloride when injected into the peritoneal cavity of a dog. Weight of dog, 9 Kg.; 500 milliliters of solution injected.

in the fluid when first injected and becomes gradually concentrated as the water and salts leave the peritoneal cavity. In experiments in which nonprotein nitrogen was determined separately, these constituents equaled the concentration in the blood in from fifteen to thirty minutes and did not rise beyond this level.

Chart 2 presents similar results in a fluid which more nearly represents the composition of interstitial fluid. There were a small decrease of bicarbonate and the appearance of undetermined acid ions.

Chart 3 gives the results when Hartmann's solution is used. This solution resembles interstitial fluid, except that lactate is substituted for

bicarbonate. In this experiment the basic ions, except magnesium, were determined individually. In order to avoid too great crowding the lines for the basic ions are drawn to the left and (K^+) and (Ca^{++}) are drawn on a different scale from the other ions. Here again the various ions are adjusted to the composition of interstitial fluid. Lactate decreases as bicarbonate increases.

Chart 4 shows the results when 5 per cent dextrose is injected intraperitoneally. The same changes take place as in the previous solutions, but the results are more striking since no electrolytes were present in this solution when injected. The dextrose is charted so that 2 moles are equivalent on the chart to 1 equivalent of the various ions. This scale makes the osmotic relationship of the dextrose approximately equivalent to that of the univalent ions. The chart shows that the increase in osmotic pressure due to electrolyte is approximately balanced by the decrease in osmotic pressure of dextrose. In other words, the osmotic pressure remains practically constant in spite of great fluctuations in the composition of the fluid.

Charts 3 and 4 show the composition of the plasma. The presence of 5 per cent dextrose in the peritoneum reduces the concentration of serum base slightly without a significant alteration in the concentration of plasma proteins. Hartmann's solution produces only slight changes in the plasma, and it should be noted that the lactate does not accumulate in the plasma. Hartmann and Senn [27] have demonstrated that sodium *r*-lactate is readily metabolized. In the experiments represented on charts 3 and 4 phosphate was determined in abdominal fluid and plasma. These results were not charted, but show an increase of phosphate in the peritoneal fluid to the level of the plasma.

Volume and Electrolyte Changes in Fluid Injected Into the Peritoneal Cavity of Guinea-Pigs.—Chart 5 illustrates the results with 0.9 per cent sodium chloride. In the experiments reported in this section each determination of volume, chloride and total base gives the results from one animal, and the curves represent determinations on a series of different animals, instead of the changes taking place in the same fluid and animal, as was the case with the dogs. However, though variations in the animals give a fairly wide scattering of results, the general trend is probably correct as represented on the charts. It will be seen that with 0.9 per cent sodium chloride solution, chloride decreases as in the dogs, and the base remains about constant. From the analogy with the dogs, it is safe to conclude that bicarbonate and other ions of interstitial fluid appear as they did in the experiments on

27. Hartmann, A. F., and Senn, M. J. E.: Studies in the Metabolism of Sodium *r*-Lactate: I. Response of Normal Human Subjects to the Intravenous Injection of Sodium *r*-Lactate, J. Clin. Investigation **11**:327, 1932.

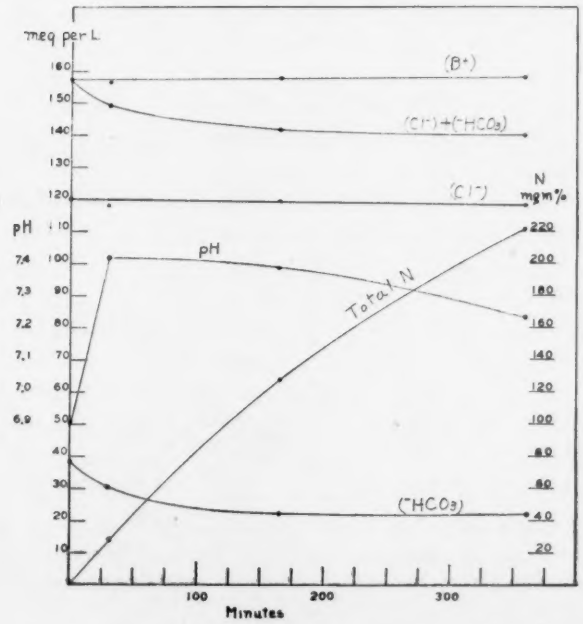

Chart 2.—Changes occurring in the composition of a mixture of sodium chloride, sodium bicarbonate and potassium chloride when injected into the peritoneal cavity of a dog. Weight of dog, 9 Kg.; 450 milliliters of solution injected.

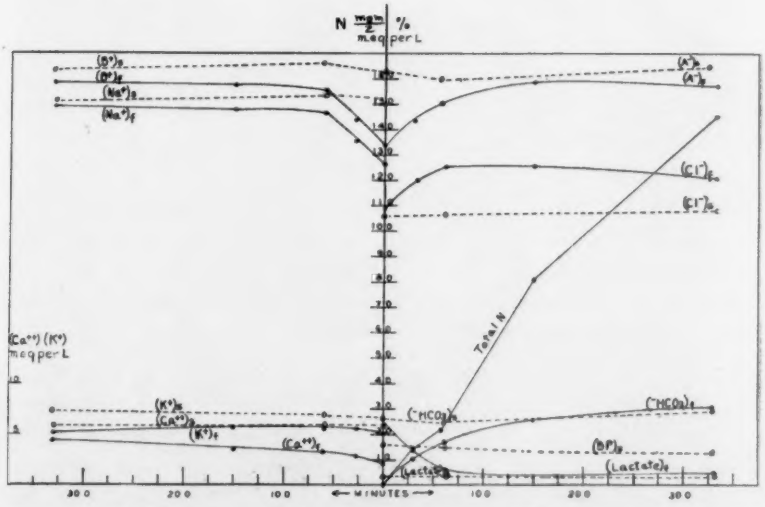

Chart 3.—Changes occurring in the composition of Hartmann's solution when injected into the peritoneal cavity of a dog. Weight of dog, 9 Kg.; 360 milliliters of solution injected. The peritoneal fluid is represented by the solid lines, and the blood serum, by broken lines.

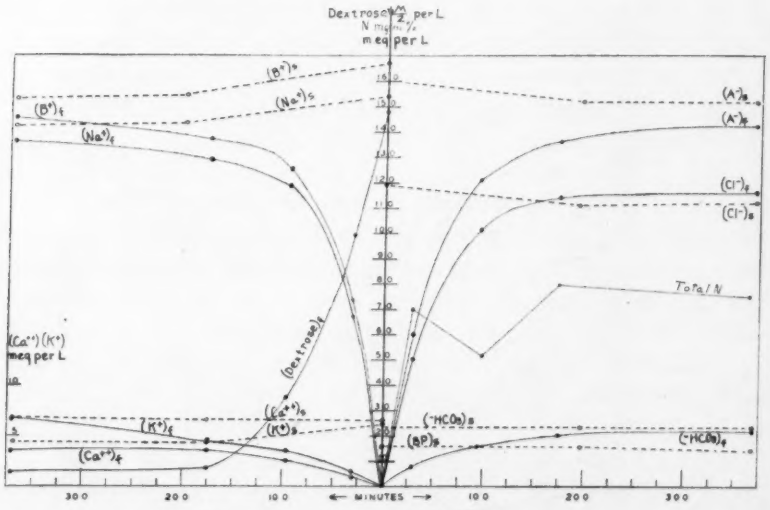

Chart 4.—Changes occurring in the composition of 5 per cent solution of dextrose when injected into the peritoneal cavity of a dog. Weight of dog, 9 Kg.; 360 milliliters of solution injected. The peritoneal fluid is represented by the solid lines, and the blood serum, by broken lines.

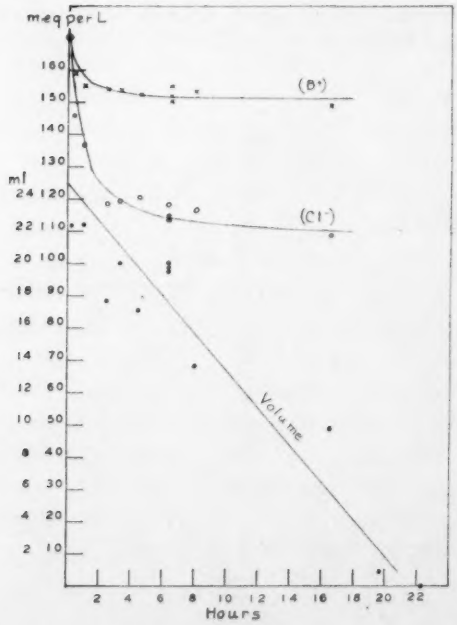

Chart 5.—Changes occurring in the volume and composition of physiologic solution of sodium chloride when injected into the peritoneal cavities of a series of guinea-pigs. Weights of guinea-pigs, from 540 to 620 Gm.; 25 milliliters of solution injected.

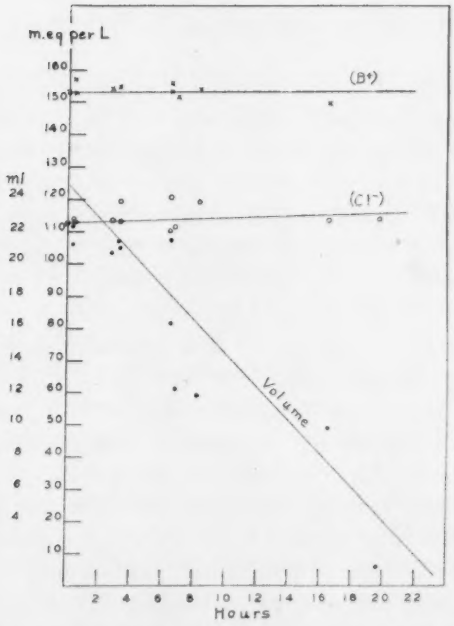

Chart 6.—Changes occurring in the volume and composition of a mixture of sodium chloride, sodium bicarbonate and potassium chloride when injected into the peritoneal cavities of a series of guinea-pigs. Weights of guinea-pigs from 480 to 580 Gm.; 25 milliliters of solution injected.

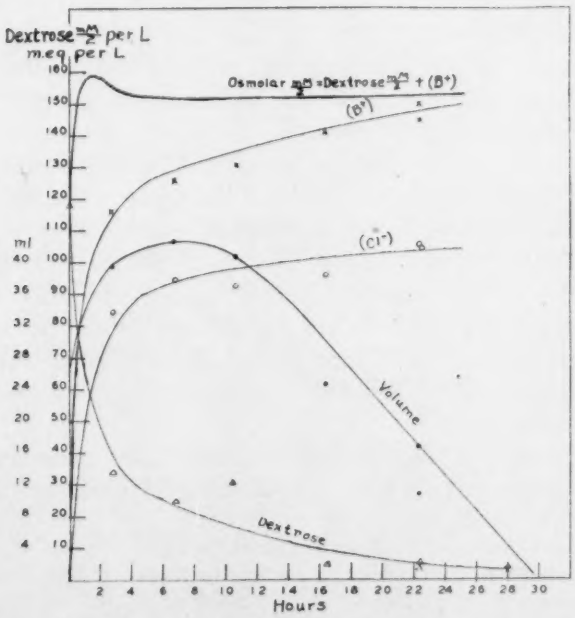

Chart 7.—Changes occurring in the volume and composition of 5 per cent solution of dextrose when injected into the peritoneal cavities of a series of guinea-pigs. Weights of guinea-pigs, from 490 to 590 Gm.; 25 milliliters of solution injected.

dogs. Chart 6 illustrates that a solution resembling interstitial fluid undergoes few changes in composition. In both cases absorption was at a fairly constant rate and started immediately after injection.

Chart 7 shows that with dextrose the electrolyte changes are accompanied by an increase in volume before absorption takes place. The increase in volume of the dextrose solution is from 25 to 40 milliliters. A similar increase in the volume of dextrose solution probably took place in the dogs, since it was usually possible to obtain fluid for about only from five to six hours in the case of salt solutions, while it could be obtained for at least from seven to eight hours in the case of 5 per cent dextrose solution. In chart 7 the approximate osmotic pressure of the dextrose solution is represented as dextrose plus twice the base in osmolar concentration. There is a rise in the osmotic pressure of the dextrose solution above that of blood soon after the solution is placed in the peritoneum. This is followed by a fall, which reaches a minimum at the time when the volume of fluid in the peritoneum has reached the maximum. Thereafter the osmotic pressure of the peritoneal fluid gradually rises as it is being absorbed. These changes in osmotic pressure can also be illustrated in experiments on dogs, and explain the migration of water into the peritoneal cavity.

COMMENT

Apparently any fluid placed in the peritoneal cavity tends to approach the composition of interstitial fluid. In each case the final composition in the experiments on dogs was approximately the same as that found by Darrow, Hopper and Cary [26] for the peritoneal transudate produced in plasmapheresis edema. Furthermore, it closely resembled human samples of exudates and transudates analyzed by various authors.[28] It should be emphasized that each individual ion tends to be adjusted to the concentration which represents equilibrium with blood plasma.

The experiments do not indicate what rôle cellular fluid may play in the alterations of fluid placed in the peritoneum. Certainly the ions appearing in the fluids injected into the peritoneum are the same as those of interstitial fluid and blood plasma, and the latter fluids presumably represent the chief, if not the sole, source of the ions migrating into the peritoneal fluid.

Cell membranes are impermeable to cations and presumably protected thereby from loss of base. However, a solution not in equili-

28. Loeb, R. F.; Atchley, D. W., and Palmer, W. W.: On the Equilibrium Condition Between Blood Serum and Serous Cavity Fluids, J. Gen. Physiol. **4**: 591, 1922. Hastings, A. B.; Salvesen, H. A.; Sendroy, J., Jr., and Van Slyke, D. D.: Studies of Gas and Electrolyte Equilibria in Blood: IX. The Distribution of Electrolytes Between Transudates and Serum, ibid. **8**:701, 1927.

brium with cellular fluid may alter the latter by changes in the anion and water content. In the experiments with dextrose on guinea-pigs, the abdominal muscles looked dry, but in the other experiments no gross abnormality was detected.

It is generally recognized that a solution which is isotonic and made up of certain ions or molecules which cannot be considered abnormal in interstitial fluid may be irritating. This is illustrated by the fact that isotonic bicarbonate solutions, even with the hydrogen ion concentration properly adjusted, may cause pain and be absorbed poorly. Furthermore, a 5 per cent solution of dextrose often causes distention when injected into the peritoneum and occasionally leads to a tender doughy swelling which persists for a day or two at the site of subcutaneous injection. In the case of dextrose, some of the irritating properties are controlled by sterilizing while dry, so as to avoid the formation of toxic hydrolitic products (Shohl [29] and Schwentker [30]).

The hydrogen ion concentration of the solution injected has been thought to be an important cause of untoward reactions.[30] Since p_H is the intensity factor, no great amount of work will be done in altering the reaction unless the capacity factor (or buffer value) is also large. The exact analogy is the high potential current which may be applied to the skin without harm provided that the current is sufficiently small. Since dextrose solutions do not have a high buffer value, the p_H is not likely to measure injurious properties. Hence, we believe that irritating qualities of dextrose solutions injected in large quantities are produced by a gross lack of equilibrium between the fluid and the surrounding cells rather than by the special toxic action of any ion or molecule. In this sense the osmotic properties of dextrose change the fluid of adjacent cells and blood vessels sufficiently to produce injury. Attempts to do away with all the toxic properties of 5 or 10 per cent dextrose solution by adjusting the p_H or by special methods of sterilization are not likely to succeed. However, the molecule itself is so innocuous that only under special circumstances are the osmotic properties capable of producing serious local injury.

Inspection of chart 7 shows that as the concentration of dextrose decreases and that of the electrolytes increases, the rate of migration of water and electrolytes into the peritoneum decreases. The rapidity with which water and electrolytes enter a solution placed in the peritoneum may be used as an index of the ability of that fluid to alter the surrounding cellular fluid and hence injure adjacent structures.

29. Shohl, A. T., and Beal, F.: Preparation of Dextrose for Intraperitoneal Injection, Am. J. Dis. Child. **38**:943 (Nov.) 1929.

30. Schwentker, F. F.: The Preparation of Dextrose for Parenteral Injection, Am. J. Dis. Child. **40**:533 (Sept.) 1930.

When dextrose is below 2.5 per cent and the sodium ions are more than 75 milliequivalents per liter, the rate of change begins to decrease rapidly. Practically, these are the concentrations of dextrose and sodium chloride that are not irritating, since it has been found safe to inject subcutaneously solutions made by mixing equal parts of 5 per cent dextrose and 0.9 per cent saline. However, dilution of 5 per cent dextrose with physiologic solution of sodium chloride so as to decrease the rapidity of ingress of electrolyte diminishes the concentration of dextrose, so that such subcutaneous injections lose a great deal of their value as methods of administering dextrose. We believe, therefore, that parenteral administrations of dextrose should be largely confined to intravenous injections.

The experiments indicate that electrolyte solutions made up largely of sodium and chloride ions are quickly adjusted to the composition of interstitial fluid. Perfusion experiments demonstrate that small amounts of calcium and potassium are essential to cardiac activity. Although the lack of these ions in fluid surrounding cells undoubtedly alters the behavior of other cells, experience indicates that any changes which occur in connective tissue cells are not of sufficient importance to make it absolutely necessary to include potassium and calcium in making up a solution for subcutaneous injection. Since perfusion experiments do not show that the bicarbonate ion in interstitial fluid is essential for cellular activity, bicarbonate or its equivalent is included in a fluid administered parenterally, largely for its general effect.

SUMMARY

The changes occurring in electrolytes of various solutions when injected into the peritoneal cavity of dogs and guinea-pigs were studied. The following solutions were used: (1) 0.9 per cent sodium chloride, (2) a mixture of sodium chloride, sodium bicarbonate and potassium chloride resembling interstitial fluid, (3) Hartmann's solution of sodium chloride, potassium chloride, calcium chloride and sodium lactate and (4) 5 per cent dextrose solution.

In each case the solutions injected into the peritoneal cavity underwent alterations in electrolyte concentration which indicate that they tend to approach the composition of interstitial fluid.

Electrolyte solutions were absorbed at an approximately constant rate, but the dextrose solution increased in volume before being absorbed.

It is pointed out that isotonic dextrose solutions undergo such great alterations in concentration and volume that subcutaneous or intraperitoneal injection probably is injurious to delicate tissues.

TREATMENT OF CONGENITAL SYPHILIS WITH ACETARSONE (STOVARSOL) BY MOUTH

ALFRED S. TRAISMAN, M.D.
CHICAGO

Acetarsone, more commonly called stovarsol by the French and Americans and spirocid by the Germans, has been employed in the foreign clinics in the treatment of congenital syphilis since 1924. Numerous reports on the use of this drug have appeared in the foreign literature during the last several years.

It has been only within the last year or two that several American clinicians have begun to use acetarsone (stovarsol) in the treatment of congenital syphilis, and it has been only within the last four or five months that the first three reports have appeared in the American literature. Of these three reports, two have come from clinics in Chicago. In these papers the literature is fully reviewed.

Acetarsone, chemically known as acetylaminohydroxyphenylarsonic acid, is a white tablet which is odorless and is insoluble in water. It is marketed in 0.1 Gm. and 0.25 Gm. tablets. It contains from 27.1 to 27.4 per cent arsenic. In comparison, the arsenic content of neoarsphenamine is 19 per cent and that of sulpharsphenamine 21 per cent.

DOSAGE

The dosage of acetarsone employed by the various foreign authors has varied widely. There has been a difference of opinion concerning the daily dosage of the drug, the total quantity to be administered and the duration of the course of treatment. The daily dosage has varied from 0.01 to 1 Gm., and the total amount has varied from 3 to over 50 Gm. in one course of treatment.

Certain authors have recommended continuous daily dosages of acetarsone for periods varying from six weeks to three months. Others have advised gradually increasing doses, giving courses of from seven to ten weeks, interrupted by rest periods of from four days to one week.

From the Pediatric Department, Northwestern University Medical School.
Read before the Chicago Pediatric Society, Oct. 18, 1932.
The acetarsone (stovarsol) used in this series of cases was furnished by Merck & Co.

Among the American authors, Maxwell and Glaser [1] employed the dosage recommended by J. Tuscherer [2] (table 1). Later, however, owing to two cases of arsenical poisoning in their series, they adopted the dosage recommended by Martin,[3] which is approximately two-thirds the dosage used by Tuscherer and lasts eight days longer.

Rosenbaum,[4] in his series of cases, adopted the dosage recommended by A. Bratusch-Marrain [5] (table 2). The same dosage has been employed in the series of cases reported in this paper.

The great variety of dosages used emphasizes the fact that no hard and fast rule can be employed. The tolerance of the patient must be

TABLE 1.—*Dosage Employed by J. Tuscherer in Acetarsone Therapy*

Course, Days	No. Tablets	No Times Daily
3	¼ (0.25 Gm.)	1
3	¼ (0.25 Gm.)	2
3	¼ (0.25 Gm.)	3
3	¼ (0.25 Gm.)	4
3	½ (0.25 Gm.)	3
3	½ (0.25 Gm.)	4
3	1 (0.25 Gm.)	2
20	1 (0.25 Gm.)	3
Total 41	84 (21 Gm.)	

TABLE 2.—*Dosage Employed by A. Bratusch-Marrain in Acetarsone Therapy*

Course, Days	Dose, Gm. per Kg. of Body Weight
7	0.005 (approx. 1/13 grain)
7	0.010 (approx. 1/7 grain)
7	0.015 (approx. 1/4 grain)
42	0.020 (approx. 1/3 grain)
Total course, 9 weeks; rest period, 6 weeks	

considered and the possibility of hypersensitiveness to the drug must be taken into account. The treatment should always be initiated in doses which are considerably below the optimal dose and then gradually increased. For that reason the plan of Bratusch-Marrain rather than that of Tuscherer has been employed in this series.

1. Maxwell, C. H., Jr., and Glaser, J.: The Treatment of Congenital Syphilis with Acetarsone (Stovarsol) Given by Mouth, Am. J. Dis. Child. **43**:1461 (June) 1932.

2. Tuscherer, J.: Zur Behandlung der Lues congenita mit Spirozid, Monatschr. f. Kinderh. **45**:62 (Sept.) 1929.

3. Martin, E.: Spirozidschaden bei Säuglingen, München. med. Wchnschr. **77**:936 (May 30) 1930.

4. Rosenbaum, H. A.: Stovarsol in the Treatment of Syphilis in Infants and Children, Am. J. Dis. Child. **44**:25 (July) 1932.

5. Bratusch-Marrain, A.: Wert und Durchführung der Spirocidbehandlung der Syphilis im Kindesalter, Arch. f. Kinderh. **92**:26 (Nov. 28) 1930.

METHOD OF ADMINISTRATION

For small infants the mother was advised to crush the amount of the acetarsone ordered, to dissolve it in water and to give it one-half hour before feeding time. When the dose ordered was large, as for the older child, the instructions were that the medication be divided equally in two or three doses and that it be given in water one-half hour before meals.

Only enough acetarsone for one week was given to the parent, with instructions as to the amount to be given at each feeding and how to administer it. The parent was then warned that at the first sign of fever, diarrhea, vomiting or the appearance of a rash the medication should be discontinued at once and the child should be returned to the clinic. The parent was also warned to keep the drug out of reach of the child being treated and out of reach of any other children in the family. Each patient returned to the clinic weekly for physical examination, for urinalysis and for the weekly supply of acetarsone.

In that manner, each child was kept under close observation during the whole nine weeks of treatment. As a result, few untoward effects or accidents occurred.

COMMENT

All of the fifty-four patients in this series presented clinical signs and symptoms of congenital syphilis and the diagnosis was corroborated by Wassermann and Kahn tests of the blood. Serologic tests were made as a routine procedure before treatment commenced and thereafter at the end of each six week rest period following each course of treatment.

Complete examinations of the blood were made before and after each course of treatment.

Urinary examinations were made before acetarsone therapy was commenced and weekly examinations were made thereafter.

Roentgenograms of the long bones were taken before treatment started and at the end of the course of treatment.

All clinical manifestations were noted at the start of treatment and their time of improvement and disappearance recorded.

The weights and temperatures were noted at weekly intervals.

Spinal punctures and examination of the spinal fluid were made as a routine measure on all patients.

In this series of fifty-four patients, fourteen were under 1 year of age (table 3), nineteen were between the ages of 1 and 6 (table 4) and twenty-one were between the ages of 6 and 12 (table 5). Of these fifty-four patients, eighteen were girls and thirty-six were boys; twenty were white and thirty-four colored.

EFFECT OF ACETARSONE THERAPY ON WASSERMANN AND KAHN REACTIONS

In Infants Under One Year of Age.—For all of the fourteen infants under 1 year of age the Wassermann and Kahn reactions were 4 plus before treatment commenced. After the first course of treatment with acetarsone the Wassermann reaction became negative in ten cases and 3 plus in one case, and remained 4 plus in three cases.

After the first course of acetarsone, the Kahn reaction became negative in ten cases and remained 4 plus in four cases.

The amount of acetarsone given in each case during the nine weeks course of treatment corresponds approximately to the weight of the child in kilograms (table 3).

TABLE 3.—*Effect of Acetarsone Therapy on Wassermann and Kahn Reactions in Infants Under One Year of Age*

				Before Treatment					After Treatment			
				Weight		Wassermann			Weight		Wassermann	
Case	Age	Sex	Race	Lb.	Oz.	Reaction	Kahn Reaction	Dose, Gm.	Lb.	Oz.	Reaction	Kahn Reaction
1	10 wks.	M	C	9	9	4 plus	4 plus	4.5	13	13	4 plus	4 plus
2	10 wks.	M	C	14	5	4 plus	4 plus	7.0	18	5	Negative	Negative
3	8 wks.	F	C	8	12	4 plus	4 plus	4.3	13	2	Negative	Negative
4	7 wks.	F	W	7	9	4 plus	4 plus	4.5	11	10	4 plus	4 plus
5	8 wks.	M	W	11	7	4 plus	4 plus	5.0	15	8	Negative	Negative
6	6 wks.	M	W	5		4 plus	4 plus	3.0	11		Negative	Negative
7	8 mos.	M	C	16		4 plus	4 plus	6.5	20	5	4 plus	4 plus
8	7 wks.	M	C	14	4	4 plus	4 plus	6.8	17	4	Negative	Negative
9	4 mos.	M	C	11	4	4 plus	4 plus	5.4	13	6	Negative	Negative
10	2 mos.	M	C	9	4	4 plus	4 plus	5.0	11	6	Negative	Negative
11	4 mos.	F	C	10	9	4 plus	4 plus	5.2	14	6	3 plus	4 plus
12	1 mo.	F	C	7		4 plus	4 plus	4.2	11		Negative	Negative
13	10 wks.	M	W	10	5	4 plus	4 plus	5.1	14		Negative	Negative
14	4 mos.	M	W	13		4 plus	4 plus	6.0	17		Negative	Negative

In Children From One to Six Years of Age.—In the nineteen patients between the ages of 1 and 6 years the Wassermann reaction before treatment was 4 plus in fifteen cases, 3 plus in three cases and negative in one case. The last-mentioned case was that of a child whose parents were deaf-mutes. The mother of this child had dementia paralytica and the father's Wassermann reaction was 4 plus. The child had a 4 plus Kahn reaction.

The Kahn reaction in this group, before treatment, was 4 plus in sixteen cases, 3 plus in two cases and 2 plus in one case.

After the first course of treatment, the Wassermann reaction became negative in ten cases and 2 plus in two cases, and remained 4 plus in six cases. After treatment the Kahn reaction became negative in six cases, 2 plus in one case and 3 plus in two cases, and it remained 4 plus in nine cases.

The amount of acetarsone given in each case during the nine weeks of treatment can be noted in table 4.

TABLE 4.—*Effect of Acetarsone Therapy on Wassermann and Kahn Reactions in Children from One to Six Years of Age*

				Before Treatment					After Treatment			
				Weight		Wassermann	Kahn	Dose,	Weight		Wassermann	Kahn
Case	Age	Sex	Race	Lb.	Oz.	Reaction	Reaction	Gm.	Lb.	Oz.	Reaction	Reaction
15	18 mos.	M	C	18	14	4 plus	4 plus	9.3	22	4	4 plus	4 plus
16	27 mos.	M	W	30	8	3 plus	4 plus	12.1	31	12	Negative	Negative
17	4 yrs.	M	C	33		4 plus	4 plus	14.0	37	8	4 plus	4 plus
18	6 yrs.	M	C	40		4 plus	4 plus	16.0	44		4 plus	4 plus
19	5 yrs.	M	W	40	12	4 plus	4 plus	18.2	40		2 plus	4 plus
20	5 yrs.	F	C	49		4 plus	4 plus	21.2	52	8	4 plus	3 plus
21	4½ yrs.	F	W	36		Negative	4 plus	20.2	42	8	Negative	Negative
22	4 yrs.	F	C	41		4 plus	4 plus	17.0	43		Negative	2 plus
23	3½ yrs.	M	C	33	12	4 plus	4 plus	13.7	36		Negative	Negative
24	3 yrs.	M	C	26		4 plus	3 plus	12.7	27		Negative	Negative
25	4½ yrs.	M	C	36	8	4 plus	4 plus	19.5	38	8	4 plus	4 plus
26	6 yrs.	F	C	46		4 plus	4 plus	(Died)				
27	4 yrs.	M	C	38	8	3 plus	3 plus	19.0	41	8	Negative	Negative
28	6 yrs.	M	C	41	8	3 plus	4 plus	20.5	44	8	Negative	Negative
29	6 yrs.	F	W	39	8	4 plus	4 plus	19.0	42		Negative	4 plus
30	4 yrs.	F	W	29	8	4 plus	2 plus	12.0	30	8	Negative	Negative
31	4 yrs.	M	C	40		4 plus	4 plus	19.5	42		2 plus	3 plus
32	6 yrs.	F	W	43		4 plus	4 plus	19.8	41		4 plus	4 plus
33	3 yrs.	M	W	31	8	4 plus	4 plus	11.8	36	8	Negative	4 plus

TABLE 5.—*Effect of Acetarsone Therapy on Wassermann and Kahn Reactions in Children from Six to Twelve Years of Age*

				Before Treatment					After Treatment			
				Weight		Wassermann	Kahn	Dose,	Weight		Wassermann	Kahn
Case	Age	Sex	Race	Lb.	Oz.	Reaction	Reaction	Gm.	Lb.	Oz.	Reaction	Reaction
34	7 yrs.	M	W	49		3 plus	3 plus	20.7	49	8	Negative	2 plus
35	7 yrs.	F	C	56		3 plus	3 plus	24.5	58		Negative	Negative
36	12 yrs.	M	C	95		4 plus	4 plus	42.5	102		Negative	3 plus
37	9 yrs.	M	C	96		4 plus	4 plus	39.3	96		Negative	Negative
38	9 yrs.	F	C	55		4 plus	4 plus	20.8	58	8	4 plus	4 plus
39	9 yrs.	F	C	77		4 plus	4 plus	30.8	88		Negative	Negative
40	7 yrs.	M	W	52	8	4 plus	4 plus	21.6	60		4 plus	4 plus
41	10 yrs.	M	W	58		4 plus	4 plus	22.0	62	8	Negative	4 plus
42	10 yrs.	M	C	59		4 plus	4 plus	26.2	65		4 plus	3 plus
43	8 yrs.	M	W	53		2 plus	3 plus	25.4	57	8	Negative	Negative
44	11 yrs.	M	W	47	8	2 plus	4 plus	25.0	54	8	Negative	3 plus
45	10 yrs.	M	W	46		4 plus	4 plus	20.2	48		4 plus	4 plus
46	7 yrs.	M	C	41		2 plus	4 plus	19.0	44	8	Negative	4 plus
47	10 yrs.	M	C	63		4 plus	4 plus	25.6	65		4 plus	4 plus
48	12 yrs.	F	C	76		4 plus	4 plus	30.5	78		Negative	3 plus
49	11 yrs.	M	C	68	8	4 plus	4 plus	27.0	69	8	4 plus	4 plus
50	11 yrs.	F	W	72		4 plus	4 plus	32.0	75	8	4 plus	4 plus
51	11 yrs.	M	C	60	8	3 plus	4 plus	26.2	62	8	3 plus	4 plus
52	11 yrs.	F	C	76		4 plus	4 plus	38.0	82		4 plus	4 plus
53	9 yrs.	F	W	69		4 plus	4 plus	31.2	71		4 plus	4 plus
54	10 yrs.	M	W	63		4 plus	4 plus	26.0	66		4 plus	4 plus

In Children From Six to Twelve Years of Age.—In this group of twenty-one patients between the ages of 6 and 12 years, the Wassermann reaction before treatment was 4 plus in fifteen, 3 plus in three and 2 plus in three.

The Kahn reaction before treatment in this group was 4 plus in eighteen cases and 3 plus in three.

After one course of treatment the Wassermann reaction became negative in ten cases and 3 plus in one, and it remained 4 plus in ten cases.

After treatment, the Kahn reaction became negative in only four cases, 2 plus in one, 3 plus in four and 4 plus in twelve.

The amount of acetarsone given in each case during the nine weeks of treatment corresponded approximately to the weight of the child in kilograms (table 5).

Forty patients in this series have completed a second nine weeks' course of treatment. Of this group, 50 per cent had a reversal of the Wassermann reaction and 33 per cent showed a reversal of the Kahn reaction.

EFFECT OF ACETARSONE THERAPY ON PHYSICAL DEVELOPMENT

Acetarsone has a marked beneficial effect on the physical development of the syphilitic infant and child.

Of the fifty-four patients treated, only two showed a slight loss of weight during the nine weeks of treatment: One showed a loss of three fourths of a pound (340 Gm.) and the other showed a loss of 2 pounds (907.1 Gm.); one child's weight remained stationary.

The average gain in weight in the group of infants under 1 year of age (table 3) was 3¾ pounds (1,700.9 Gm.). In the group of children from 1 to 6 years of age, the average gain of weight during the nine weeks' course of treatment was 2½ pounds (1,133.9 Gm.) (table 4). In the group of children from 6 to 12 years of age, the average gain in weight was 3¾ pounds (table 5).

The remarkable gain in weight and the improvement in appetite have been noted by several authors and have prompted Tezner [6] and Niederwieser [7] to employ acetarsone in the treatment of nonsyphilitic dystrophic children, especially those prematurely born, with good results.

EFFECT OF ACETARSONE THERAPY ON SYMPTOMS

Acetarsone is effective in the healing of all cutaneous lesions and has a rapid curative action on lesions of the bone, especially epiphysitis,

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6. Tezner, O.: Effect of Stovarsol on Poorly Thriving, Nonsyphilitic Nurslings, Monatschr. f. Kinderh. **34**:6, 1926.

7. Niederwieser, V.: The Use of Spirocid in Nonsyphilitics, Wien. klin. Wchnschr. **42**:741, 1929.

periostitis and dactylitis. All patients with interstitial keratitis in this series improved greatly under this treatment.

One child who had frequent epileptiform seizures daily improved markedly while under treatment with acetarsone. The seizures became very infrequent. Instead of several times daily, they occurred only once or twice in a period of two or three weeks. This child gained 11 pounds (5 Kg.) during the first course of treatment with acetarsone.

Another child who had a left hemiplegia, who was backward mentally and who had difficulty with his speech and in walking, also improved greatly under treatment with acetarsone. He became more active, he gained in weight, his appetite improved, his gait became straighter and stronger, his speech improved and he became mentally brighter.

TABLE 6.—*Effect of Acetarsone Therapy on Symptoms and Findings*

Before Treatment	Cases	After Treatment
Snuffles	12	Disappeared in from 4 to 8 weeks
Epitrochlear lesion	11	Persisted
Desquamation of palms and soles	9	Disappeared in from 4 to 8 weeks
Maculopapular syphilid	8	Disappeared in from 1 to 3 weeks
Palpable spleen	8	Disappeared at end of course in 5 cases; persisted in 3
Interstitial keratitis	7	Improved
Epiphysitis	7	Disappeared in from 1 to 4 weeks
Mulberry molars	6	Persisted
Saddle nose	6	Persisted
Condylomas	5	Disappeared in from 1 to 3 weeks
Craniotabes	4	Disappeared in from 4 to 8 weeks
Circinate lesions on forehead	2	Disappeared in from 2 to 3 weeks
Dactylitis	2	Disappeared in 6 weeks
Bony exostoses	1	Persisted
Hutchinson's teeth	1	Persisted
Ulceration of legs	1	Healed in 2 weeks
Epilepsy	1	Improved
Hemiplegia	1	Improved

Table 6 shows the effect of acetarsone therapy on the symptoms and clinical findings in the cases in this series.

EFFECT OF ACETARSONE THERAPY ON ROENTGEN FINDINGS

Roentgenograms were taken of each patient before treatment was begun. Plates were taken of the long bones, the fingers and, when necessary, the skull. Another series of films of the same bones were made after the course of treatment was completed.

Seventeen of the fifty-four cases showed definite syphilitic changes in the bones. Fourteen cases showed definite periostitis. In seven cases, epiphysitis was revealed by a widening of the provisional zone of calcification with submetaphyseal rarefaction. Six cases showed destructive lesions and foci of rarefaction at the metaphyses. Two infants showed syphilitic dactylitis.

Of the seventeen patients showing pathologic changes roentgenologically, ten were infants under 1 year of age, five were in the age

group between 1 and 6 years and two were in the age group between 6 and 12 years.

In all the cases the osseous changes were completely healed after one course of treatment.

All changes in the bone noted in this series were bilateral. No tertiary lesions of the bone were seen in this series of cases.

EFFECT OF ACETARSONE THERAPY ON URINE

Fourteen cases of this series showed a slight trace of albumin in the urine during the first course of treatment. After treatment was completed and following the rest period of six weeks, the urine in each of these cases became normal.

During treatment, three cases showed 2 plus albumin, which also disappeared after the treatment was completed.

One case showed albumin casts and red blood cells accompanying an arsenical dermatitis.

Only in those cases which showed a marked albuminuria or in which albumin casts and red blood cells were noted was the acetarsone discontinued. A trace of albumin noted occasionally during the course of treatment was not a contraindication to acetarsone therapy.

EFFECT OF ACETARSONE THERAPY ON BLOOD

Routine examinations of the blood in this series revealed that the untreated young infants suffered from a marked secondary anemia. Six infants showed a hemoglobin content of between 50 and 60 per cent. Following treatment the hemoglobin and erythrocyte values were found to be improved. In each of these six infants after the first course of treatment the hemoglobin rose from 10 to 15 per cent and the erythrocytes rose proportionately.

The differential counts were noteworthy only so far as the eosinophils were concerned. Thirty-one cases showed an eosinophilia varying from 1 to 9 per cent before treatment was commenced. After treatment fifteen cases still showed an eosinophilia varying from 1 to 8 per cent. In five cases in which no eosinophils were noted before treatment, eosinophilia was noted after the first course of treatment, as follows: 3 per cent in three cases, 1 per cent in one case and 12 per cent in one case.

EXAMINATION OF THE SPINAL FLUID

Thirty-one patients of this series were hospitalized for spinal punctures and examination of the spinal fluid. In each instance the Wassermann and Kahn reactions were negative, and the cell counts and Lange test were normal. One case showed a slight trace of albumin and a

positive test for albumin, with flocculation; four showed a positive test for albumin, but no flocculation.

UNTOWARD EFFECTS

Among the fifty-four patients treated in this series, one death occurred. This case was reported in detail in a previous paper.[8] It may be well to review this case briefly. A colored girl, 6 years of age, showing periostitis and 4 plus Wassermann and Kahn reactions, was treated with acetarsone. She took the treatment well for the first four weeks, receiving a total of 6.5 Gm. At this time she showed albumin and occasional red blood cells and granular casts in the urine. Medication was immediately discontinued. At the same time a scaly rash developed over the chest and abdomen, and treatment with intravenous injections of sodium thiosulphate solution was begun. Four days after the development of the eruption, diarrhea and abdominal pains were complained of. The temperature rose to 100 F. and the child looked toxic. The intravenous administration of sodium thiosulphate solution was continued, the last injection being given sixteen days after the onset of the untoward symptoms. At this time the child looked much improved. Her temperature was normal, she was no longer toxic, her skin was almost clear and the diarrhea and abdominal pain had ceased. The following day she died suddenly. No autopsy was permitted.

In two infants diarrhea developed during the course of treatment, which cleared up on discontinuing the drug for five days. Acetarsone was then continued and the course was finished without any further complaints.

In one infant an erythematous rash developed on the body during the second week of treatment. Treatment was discontinued for one week and the rash disappeared. Acetarsone was again prescribed, and after one week of treatment a slight diarrhea developed. Again treatment was discontinued. After a rest period of one week, treatment was again commenced and the course was finished with no further untoward effect.

One child aged 5 years had completed the first course of treatment with acetarsone when a slight scaling and itching of the skin of the arms and chest developed. This mild cutaneous reaction cleared up rapidly after the application of a healing ointment.

In one child aged 6 years numerous red, glossy, dome-shaped papules developed on the dorsa of the hands, with itching but without scaling. Acetarsone therapy was stopped for one week and the lesions disappeared. The course of treatment was finished with no further reaction.

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8. Abt, A., and Traisman, A. S.: Stovarsol in the Peroral Treatment of Congenital Syphilis, J. Pediat. **1**:172 (Aug.) 1932.

In one infant, eight weeks after the completion of the first course of treatment, a hemorrhagic eruption developed on the palms and soles which was diagnosed as an arsenical dermatitis. After the injection of a small dose of sodium thiosulphate intramuscularly the rash disappeared and the infant is now on the second course of treatment.

In one 10 year old child an infection of the mouth developed during the seventh week of the third course of treatment. The child was receiving 10 grains (6.648 Gm.) of acetarsone daily. Smears and cultures taken from the lesions of the mouth were positive for Vincent's organisms. Treatment was continued and the infection of the mouth cleared up in one week.

SUMMARY

Acetarsone is a preparation containing from 27.1 to 27.4 per cent of arsenic. This preparation, administered by mouth, was used in the treatment of fifty-four patients with congenital syphilis.

The following method of dosage was used in this series: The first week, 0.005 Gm. per kilogram of body weight was administered daily; the second week, 0.010 Gm.; the third week, 0.015 Gm., and the fourth week, 0.020 Gm. During the following five weeks the dosage was 0.020 Gm. per kilogram of body weight daily. The total duration of the course of treatment was nine weeks. A rest period of six weeks followed the treatment. The drug was administered by mouth. The amount ordered was dissolved in water and given one-half hour before feedings.

In the group of infants under 1 year of age 71 per cent showed a reversal of the Wassermann and Kahn reactions. In the group of children between the ages of 1 and 6 years, the Wassermann reaction became negative in 55 per cent and the Kahn reaction became negative in 33 per cent. In the group between 6 and 12 years of age, the Wassermann reaction became negative in 47 per cent and the Kahn reaction became negative in 19 per cent.

In the forty patients completing a second course of acetarsone therapy, the Wassermann reaction became negative in 50 per cent and the Kahn reaction became negative in 33 per cent.

The clinical symptoms improved rapidly and the physical development also showed marked improvement.

No serious urinary changes were noted in this series except in the child in whom a severe arsenical dermatitis developed.

The blood of the younger infants showing a secondary anemia improved rapidly with acetarsone therapy. Eosinophilia was a frequent finding.

Lesions of the bones showed rapid healing in all cases, both clinically and roentgenologically, after one course of treatment.

The untoward reactions were few and slight in this series, except in one child who developed a severe arsenical dermatitis and who died on the seventeenth day after the onset of symptoms.

Examination of the spinal fluid gave negative results in the thirty-one patients examined.

CONCLUSIONS

The results obtained in this series of cases warrant the belief that the peroral administration of acetarsone in the treatment of congenital syphilis is the method of choice.

The cooperation of the parents and children was greatly increased by using this method of treatment. Little difficulty was encountered in having the children return regularly for the medication.

It should be strongly emphasized that the patients being treated with acetarsone should be kept under close observation. Parents should be warned that at the first sign of a fever, vomiting, diarrhea or a rash the medication should be immediately discontinued. In this manner, any serious untoward effects can be eliminated.

Miss Florence Olmstead, Director of Nursing, assisted in assembling this material, and Miss Zoe Harpster, Director of Social Service, aided in the follow-up of these cases.

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CONCENTRATION OF CALCIUM AND PHOSPHORUS IN THE SERUM OF CHILDREN

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Data on calcium and phosphorus [1] of the serums of 250 healthy children from 5 to 16 years of age were analyzed in an investigation of dental caries.[2] This gave us an opportunity of studying the physiologic relation of these substances to such factors as age, sex and development and their physiologic variation.

METHODS

After the children had rested for at least fifteen minutes, blood was withdrawn with as little stasis as possible. It was not collected under oil. As soon as the blood clotted, the specimens were centrifugated, and the serum was separated from them. All determinations were made immediately after the collection of the blood. Duplicates for calcium were done, except in a few cases.

Calcium.—A modification of the Clark-Collip method,[3] involving the adjustment of the p_H to about 5, and two washings of the precipitate were used. The average deviation of duplicates was 0.25 mg. per hundred cubic centimeters (about 3.6 per cent).

Phosphorus.—In the great majority of the cases the Tisdall method [4] was used. Duplicates with this method showed an average difference of 2.6 per cent. The Fiske-Subbarrow method [5] was employed in 8 cases; the average difference between duplicates was 1.9 per cent. The results obtained with the Tisdall and

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From the Department of Pediatrics, Cornell University Medical College, and the New York Nursery and Child's Hospital.

This investigation was aided by a grant from the Josiah Macy, Jr., Foundation.

1. The term phosphorus as used in this paper relates to inorganic phosphate.

2. Schoenthal, L., and Brodsky, R. H.: Dietary Control and Etiology of Dental Caries, Am. J. Dis. Child. **46**:91 (July) 1933.

3. Clark, E. P., and Collip, J. B.: A Study of the Tisdall Method for the Determination of Blood Calcium with a Suggested Modification, J. Biol. Chem. **63**:461 (March) 1925.

4. Tisdall, F. F.: A Rapid Colorimetric Method for the Quantitative Determination of the Inorganic Phosphorus in Small Amounts of Serum, J. Biol. Chem. **50**:329 (Feb.) 1922.

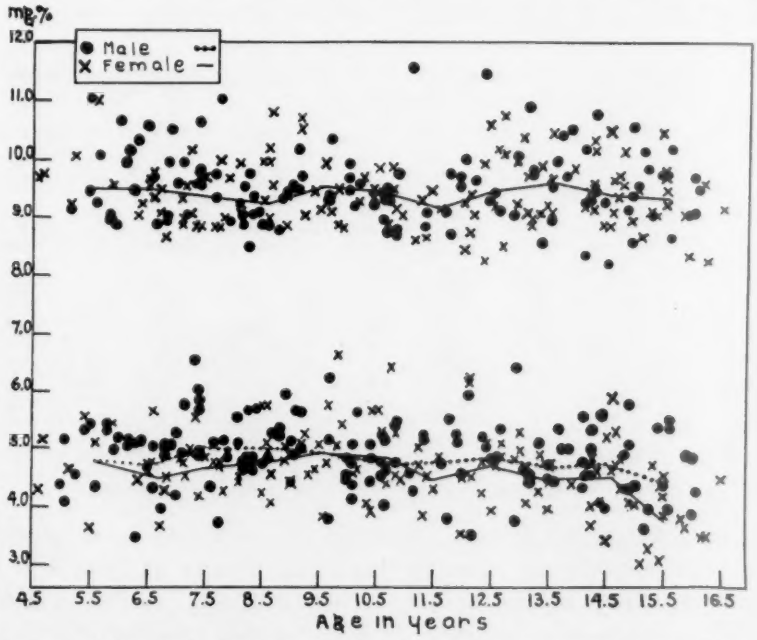
5. Fiske, C. H., and Subbarow, Y.: The Colorimetric Determination of Phosphorus, J. Biol. Chem. **66**:375, 1925.

the Fiske methods were compared on a statistical basis, and showed no significant difference.[6] Therefore results obtained with the Fiske method were included in this paper.

Refractive Index.—The same refractometer (Pulfrich) was used for all determinations. For the calculation of protein from the refractive index, Neuhausen's method was used.[7] A comparison of these values with the results of Kjeldahl determinations showed that the latter were about 7 per cent lower than the former.

RESULTS

Relation Between Calcium and Phosphorus and Age During Childhood.—In the chart, calcium and phosphorus of the serum are plotted



Serum calcium and phosphorus and their relation to age and sex. Since no significant difference in the serum calcium of boys and that of girls was found, the upper single heavy line connects the mean of all determinations; in the lower curve (phosphorus), the means of the values for boys and girls are given separately.

against age. It is evident that there is no significant variation in the curve representing the calcium. The fluctuations of this curve are within the limits of error of the method. The average results of our

6. A difference was considered significant when the differences between the means of the two series exceeded by threefold or more the differences of their respective probable errors.

7. Neuhausen, B. S., and Rioch, D. M.: The Refractometric Determination of Serum Proteins, J. Biol. Chem. **55**:353 (March) 1923.

calcium determinations are lower than some of those observed by other investigators. This is probably due to the method used in this study. In contradistinction to this, the phosphorus curve shows a decline toward adolescence. Between the ages of 5 and 14 years, the phosphorus varied only slightly. A sudden drop occurred between 14.5 and 15.5 years. A statistical comparison of the values for the age groups of 15, 16 and 17 years and the other age groups shows a significant difference between these groups.

Relation Between Calcium and Phosphorus and Sex During Childhood.—Data for 137 boys and 122 girls were available. There was no difference in the calcium level of boys and girls. The level of phosphorus had a tendency to be lower for the girls than for the boys in

TABLE 1.—*Calcium and Phosphorus and Gain in Height and Weight During Childhood*

	Boys					Girls				
Age Period, Years	Number of Cases	Gain in Weight, Pounds	Gain in Height, Inches	Calcium	Phosphorus	Number of Cases	Gain in Weight, Pounds	Gain in Height, Inches	Calcium	Phosphorus
5–6	7	4.32	3.3	9.37	4.91					
6–7	8	5.22	2.59	9.75	4.68	7	5.15	2.6	9.43	4.48
7–8	11	5.81	2.25	9.49	4.91	11	7.16	2.42	9.18	4.71
8–9	14	4.3	1.78	9.00	5.00	9	6.0	1.67	9.53	4.69
9–10	8	4.84	1.64	9.46	5.17	9	7.46	1.98	9.3	4.97
10–11	15	7.72	1.78	9.37	4.63	10	10.23	2.13	9.45	4.84
11–12	7	11.0	1.8	9.43	4.79	4	8.8	1.84	9.02	4.59
12–13	7	11.4	2.4	9.56	4.93	11	8.35	1.61	9.24	4.53
13–14	10	8.75	1.7	9.7	4.67	11	8.61	1.3	9.36	4.57
14–15	14	14.7	2.4	9.33	4.73	15	8.86	0.76	9.37	4.45
15–16	7	12.2	2.8	9.45	4.46	8	6.25	1.19	9.20	3.64

practically all the age groups (see chart). A statistical evaluation of these differences shows, however, that in age groups of from 5 to 14 years they are of no significance. In both males and females a statistically significant drop occurs at the ages between 14.5 and 15.5 years. The drop is much greater in the female than in the male, and there is a significant difference between the two groups.

Relation Between Calcium and Phosphorus and Growth During Childhood.—It has been suggested that a relation exists between the level of serum phosphorus and growth. A great number of children were followed for at least one year after the phosphorus determinations were done, and the heights and weights during this period were measured. These data are shown in table 1. There is no clearcut parallelism between gain in height and weight and the level of serum phosphorus. Since calcium levels remained unchanged during childhood, no relation could be established between serum calcium and growth.

Spontaneous Variation of Calcium, Phosphorus and Protein of the Serum.—In 7 children whose diets remained constant, calcium, phosphorus and the refractive index were determined in December to January, 1929 and 1930; May to June, 1930, and March to April, 1931 (table 2). The maximum variation in calcium is 1.03 mg. per hundred cubic centimeters; in phosphorus, 1.64 mg., and in serum protein, 0.82 mg. The changes in these substances do not seem to be interdependent in these cases.

For therapeutic purposes, a group of 100 children included in this study was given viosterol [8] over a period of thirteen months, with

TABLE 2.—*Physiologic Variation of Calcium, Phosphorus and Serum Protein with Successive Determinations*

Name	Age	Date	Calcium	Phosphorus	Refractive Index (Protein)
S. A.	7	12/31/29	9.66	4.67	
		6/ 9/30	9.18	4.69	7.06
		3/20/31	9.15	4.80	7.25
M. A.	8	12/31/29	8.93	5.45	
		5/20/30	8.75	5.65	6.81
		3/20/31	9.04	5.03	7.18
M. B.	6	1/ 9/30	9.45	4.65	
		5/20/30	9.07	5.02	7.5
		3/18/31	9.47	4.46	7.89
L. Y.	14	2/19/30	9.42	4.51	7.69
		5/23/30	8.64	4.49	6.87
		3/30/31	8.39	3.94	7.45
M. M.	5	1/ 9/30	9.03	5.03	
		5/20/30	9.29	5.89	6.92
		3/20/31	9.04	4.25	7.08
S. P.	14	1/25/30	9.6	4.90	
		5/24/30	9.29	4.76	7.11
		4/25/31	10.27	4.58	7.49
J. R.	15	12/10/29	8.1	3.87	
		5/19/30	8.42	4.96	6.84
		4/25/31	....	4.41	6.80

an intermission during July and August. Calcium and phosphorus determinations of the serum were done at six month intervals. The variations of the level of these electrolytes noted after six months and after twelve months were within the limits of the analytic error. This was true for children on a well balanced diet [9] and those on a poor diet. A group of 40 children received one quart of milk with an other-

8. Viosterol was given in dosages of from 10 to 40 drops daily, according to the age of the child. This product was supplied through the courtesy of The Mead, Johnson Company, Evansville, Ind.

9. A diet was considered well balanced when it contained one quart of milk, one piece of fruit, one serving of fresh vegetables, and egg, meat or fish; a diet was considered poor when it was grossly deficient or lacking in one or two of the aforementioned foodstuffs.

wise well balanced diet. The variations of calcium and phosphorus were within the limits of the analytic methods after periods of six months and twelve months respectively. These observations seem to indicate that the levels of calcium and phosphorus of normal children are not regularly increased either by the administration of viosterol in the dosages ordinarily used, or by the inclusion of one quart of milk in the daily diet.

COMMENT

Bullock [10] recently studied the serum phosphorus in various age groups from infancy to old age, and summarized the literature on this subject. Our results are in remarkably close agreement with his data. They show, however, that the fall in serum phosphorus occurs as early as the fifteenth and sixteenth years of life. This drop seems to be related to the slowing up of growth, as indicated by the annual gain in both weight and height in girls (table 1). This correlation may also hold for boys, but our data do not cover the age period of declining growth (above 16 years). The slight inconsistencies noted in table 1 are probably due to the relatively few subjects at the different age periods. It is likely that the fluctuations may disappear with an increase in the number of observations. In favor of this view is the close correlation between the levels of phosphorus herein reported and the annual increment in height and weight as given in the tables of Holt and Howland [11] for the different age periods. The relative constancy of the level of serum calcium for both boys and girls in the different age groups eliminates it as a causative factor in the aforementioned variations of serum phosphorus.

It appears from repeated determinations on the same person that both serum calcium and serum phosphorus are more labile during childhood than during later life. This is not remarkable if one remembers the individual variation occurring in growth. Seasonal variations in phosphorus which are marked during infancy (Hess [12]) do not appear to be uniform in our data. This may be due to the fact that none of our determinations was made during the summer months. That marked individual variations do occur, even in adults, is evident from Bullock's data, which show values for phosphorus above 4.0 mg. per hundred cubic centimeters in subjects over 30 years of age.

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10. Bullock, J. K.: Physiological Variations in Inorganic Blood Phosphorus Content at Different Age Periods, Am. J. Dis. Child. **40**:725 (Oct.) 1930.

11. Holt, L. E., and Howland, J.: The Diseases of Infancy and Childhood, ed. 9, New York, D. Appleton and Company, 1926, p. 18.

12. Hess, A. F., and Lundagen, M. A.: A Seasonal Tide of Blood Phosphate in Infants, J. A. M. A. **79**:2210 (Dec. 30) 1922.

In 2 adults, Farquharson and Tibbetts[13] noted a more marked variation of calcium, phosphorus and protein during twenty-four hours than at different times of the year. Since technical reasons prevented our making determinations for fasting children, the influence of an ordinary breakfast on the level of these substances was studied in a group of 16 children. It is evident from table 3 that variations in their levels occur, the greatest difference in calcium being 0.8 mg. per hundred cubic centimeters, in phosphorus 0.6 mg. and in protein 0.5 Gm. These changes were not greater than those seen in the same

TABLE 3.—*Effect of Ordinary Breakfast on Levels of Serum Calcium, Phosphorus and Protein*

Subject	Calcium		Phosphorus		Refractive Index (Protein)	
	Before Breakfast	After Breakfast	Before Breakfast	After Breakfast	Before Breakfast	After Breakfast
M.	9.3	9.7	4.7	4.2	8.5	8.3
Spr.	9.1	9.1	5.7	5.2	6.5	6.9
K.	...	...	4.9	5.4	7.0	7.5
Qu.	...	...	4.8	4.2	7.2	6.7
L.	...	...	4.8	4.5	8.4	8.0
K.	...	...	5.3	5.2	7.5	7.3
L.	...	...	4.9	5.3	7.3	7.4
F.	...	...	5.5	5.8	...	...
S.	9.0	9.8	4.4	4.7	7.0	6.9
	9.4	9.9	4.2	4.3	6.3	6.6
	10.2	10.1	5.1	5.3	7.6	7.4
	9.8	9.8	4.4	4.2	7.1	6.9
	9.5	9.5	5.0	5.2	7.1	7.2
W.	10.3	9.9	5.2	5.3	7.5	7.9
D.	9.0	8.2	4.5	4.5	7.1	6.9
Sch.	10.3	9.7	5.6	5.2	8.0	7.8

person at various times. Since the changes following breakfast were not more significant than those observed with repeated determinations, it seems that our figures, which were obtained after breakfast, may be compared with those secured from fasting persons.

It was of interest that neither viosterol nor 1 quart of milk caused a regular increase of the calcium and phosphorus content of the serum in our series of normal children. This observation is in agreement with those made on adults by Havard and Hoyle,[14] and by Bauer, Marble

13. Farquharson, R. F., and Tibbetts, D. M.: Studies of Calcium and Phosphorus Metabolism: XVIII. On Temporary Fluctuations in the Level of Calcium and Inorganic Phosphorus in Blood Serum of Normal Individuals, J. Clin. Investigation **10**:271 (June) 1931.

14. Havard, R. E., and Hoyle, J. C.: Vitamin D in Adults: Its Effect on the Calcium and Inorganic Phosphate of the Blood, Biochem. J. **22**:713, 1928.

and Claflin,[15] who found only slight variations in these electrolytes, even if higher dosages of viosterol were given.

SUMMARY

A study of the calcium and phosphorus of the blood serums of 250 normal children from 5 to 16 years of age was made. There was no change in the level of calcium in relation to age. Phosphorus showed a significant decline, beginning with the fifteenth year of life. This occurred to a more marked degree in the girls than in the boys.

No clearcut relation between the levels of calcium and phosphorus and growth was found.

The spontaneous variation of calcium and phosphorus was of the same magnitude as that seen after the ingestion of an ordinary breakfast.

Administration of viosterol in dosages of from 10 to 40 drops daily, or of 1 quart of milk, did not regularly increase the levels of calcium and phosphorus in these children.

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15. Bauer, W.; Marble, A., and Claflin, D.: Studies on the Mode of Action of Irradiated Ergosterol: I. Its Effect on the Calcium, Phosphorus and Nitrogen Metabolism of Normal Individuals, J. Clin. Investigation **11:1** (Jan.) 1932.

RETARDATION OF DENTAL CARIES IN OUT-PATIENTS OF A DENTAL INFIRMARY

PRELIMINARY STUDY

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RUTH L. WHITE, B.S.

AND

MILTON RABINE, D.D.S.

BOSTON

In the past few years, several reports have been made of the arrest of caries through dietary changes in various children's institutions in this country and in England. The strictly controlled conditions under which these studies have been conducted have caused the profession as a whole to be skeptical as to the feasibility of a similar project in the dentist's private practice, in which rigid regulation cannot be maintained. The preliminary findings of a recent survey carried on at Forsyth Dental Infirmary indicate that results similar to those reported from institutional studies may be secured by the practitioner who has a working knowledge of nutrition.

The case histories selected for this study were those of patients who had reported to the clinic conducted by the department of nutrition of the infirmary during an eight week period chosen at random. This period extended from Feb. 1 to March 26, 1932. Cases were discarded whenever (1) the data were insufficient or (2) the initial visit to the clinic occurred during this period. These children had been under the supervision of the department for an average time of one and six-tenths years. Their ages ranged from 2 to 11 years inclusive. For purposes of study the patients were divided into two groups according to their cooperation in relation to the advice given during this time on problems of nutrition and habit-training. The number of cooperative patients was 104. The number of noncooperative patients was 28.

Following the routine of the infirmary, a child, on completion of his dental work, is presented with a card which entitles him to attend the department of nutrition. Also, a member of the staff of the dental clinic may refer to the department any child whose oral condition suggests the possibility of a nutritional disturbance.

The routine of the department of nutrition is as follows for each patient: 1. The history of family health and of prenatal and postnatal

From the Forsyth Dental Infirmary.

conditions is taken. 2. A dental examination is made, cavities are charted, and the condition of the mouth is noted. 3. Physical examination is made by a pediatrician. 4. A conference on nutrition is held. Information as to present habits in relation to food and health is secured, and instruction given to the mother and the patient. 5. Follow-up appointments are made.

A survey in a clinic of this type presents certain obstacles not found in studies carried on in institutions, where accurate data may be kept as to the exact amounts of food consumed, and where a regimen of practices for health is maintained. For illustration of the latter point, the routine of an early bedtime established in an institution makes one contribution to good nutrition which is lacking in many homes. Recognition of such factors as the variability in incomes and in the truthfulness, intelligence and stability of the parents has not been important in the institutional studies previously conducted, but is essential in the interpretation of this report.

As to income, it must be assumed that the patients attending this clinic cannot afford to pay for the services of a private dentist. Incomes fluctuated to a greater extent during the period of this study than they would during a time of economic normalcy. Because of these facts, a diet which was considered optimal could not be prescribed in every case.

In clinical interviews, experience has proved that the truthfulness of the patients' statements may be substantiated in various ways. Frequently reliance must be placed on such subjective factors as the mother's enthusiasm regarding the changed condition of the child and the improvement in his disposition. The clinician's judgment of the sincerity of the parent is, however, supplemented by more tangible observations, such as the rate of growth and other findings of the pediatrician. We have learned that a child's own statement, made when he is unguided by the parent, is usually dependable—a fact for which provision is made in the clinical routine. We have found that repeated, varied and indirect questioning is effective in obtaining accurate information.

The success of an educational clinic of this type may be measured by the reaction of the parent to the advice given. It has been found that a period of from one to six months must be allowed for the mother and the child to become adjusted to the routine recommended. During this period, pathologic conditions are still in progress but are becoming retarded. Tissue changes seem to be seeking their normal threshold. In the computation of the following tables, nevertheless, allowance has not been made for this interval of adjustment.

DENTAL FINDINGS

The progression of caries in the cooperative group was reduced 79.21 per cent, as indicated in the chart.

Method of Computation.—In item 1, table 1, the figures were compiled in the following manner: For all children above 4 years of age, an arbitrary age of 3 years (six months after the completion of dentition) was adopted in the computation of the average number of cavities a year before dietary regulation was begun. For children under 4, the age of 2 years was chosen. On this basis, the total number of cavities which were found when the child was admitted to the department of nutrition was divided by the number of years over the ages of 3 or 2.

The figures in item 2 were computed as follows: The number of new cavities which developed following the initial clinical visit was divided by the length of time intervening.

TABLE 1.—*Cooperative Patients*

Item 1.	Average number of years of possible decay before supervision was begun.....	3.2
	Average number of years of supervision.....	1.6
Item 2.	Average number of cavities per child per year before supervision was begun..	3.51
	Average number of cavities per child per year during period of supervision....	0.73
Item 3.	Average percentage decrease in caries per child.....	79.21

TABLE 2.—*Noncooperative Patients*

Item 1.	Average number of years of possible decay before supervision was begun.....	2.5
	Average number of years of supervision.....	1.6
Item 2.	Average number of cavities per child per year before supervision was begun...	3.39
	Average number of cavities per child per year during period of supervision...	3.83
Item 3.	Average percentage of increase in caries per child.....	12.97

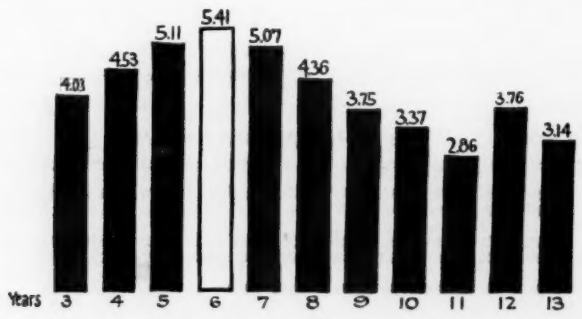
The cavities listed as new came under the following classifications: (1) incipient caries, (2) recurrent decay around fillings, (3) exposure or abscess requiring extraction of tooth.

It will be observed that the number of cavities for each child in a year, during the period of supervision, is comparable with the average expectancy for the age of 6 years, as evidenced by the graph made from the records of children treated in the clinics for dentistry and extraction, but not in the department of nutrition. It must be considered that the number of cavities computed in table 2 represents an average for children ranging from the ages of 2 to 11 years. In the chart the figures represent the number of fillings and extractions yearly for children of an age in our departments for operations and extractions.

DIETARY FINDINGS

An analysis of the dietary changes which took place under supervision was made. This analysis was based on the record of the previous

day's intake secured at each visit to the clinic, and also on the statements of the mother and child as to the average number of servings a week of the various foods. No attempt was made to define the size of the servings, but it must be granted that with the improvement in appetite, the size of the servings was automatically increased. In a large proportion of the cases, the parents' lack of understanding of child psychology had resulted in the loss of appetite. By far the most common cause of this anorexia is oversolicitation on the part of the parent,



Average number of fillings and extractions per child at the Forsyth Dental Infirmary. Note that the high point of caries represented by the white column coincides with the average initial age of the children in the group studied.

TABLE 3.—*Comparison of the Optimal Diet and the Average Diet Consumed During Supervision*

	Milk, Glasses	Eggs, Number per Week	Meat or Fish, per Week	Fruit, per Day	Vegetables (Besides Potatoes) Number Servings per Day	
					Raw	Cooked
Optimal diet	4.00	7.00	5.00	2.00	1.00	1.00
Average amount consumed before supervision	3.03	3.55	6.07	1.14	0.30	0.88
Average amount consumed during supervision	3.66	4.29	5.91	1.82	0.58	1.42
Average percentage increase or decrease	20.7 increase	20.8 increase	2.6 decrease	59.6 increase	93.3 increase	61.3 increase

manifesting itself in various ways such as a constant display of emotion at the table, with an accompaniment of coaxing, feeding and bribing. In 68 per cent of the cases in the cooperative group, an improvement in appetite was noted, compared with 14 per cent in the noncooperative group.

The following daily diet was considered optimal for dental health: 1 quart (946 cc.) of milk; one raw vegetable (or canned tomato), with special emphasis on cabbage and tomato; at least two cooked vegetables, one of which may be potato; two servings of fruit, with special emphasis on oranges; one egg; meat or fish five times a week,

and butter on vegetables and bread. An attempt was made to keep cereals and breads, because of their acid ash, as low as was consistent with the requirements for energy. Candy was allowed only at the end of the meal. Cod liver oil was not given as a routine, but was prescribed by the pediatrician in occasional cases.

Table 3 gives a comparison between the optimal diet and the average diet which was actually consumed during supervision, with the percentage of change from the former diet.

SUMMARY

1. In the preliminary findings of a study of 132 patients followed for dietary supervision over a period of 1.6 years, an average reduction of dental caries of 79.21 per cent was observed in 104 cooperative patients. In 28 noncooperative patients, an average increase in dental caries of 12.97 per cent occurred. This increase compares with the expectancy for the average age of the group studied, which was 6 years.

2. The conditions under which the study was made strongly suggest that a similar project can be successfully carried out in the office of the dental practitioner with a knowledge of nutrition and an understanding of methods of interesting his patients in dietary improvement.

Dr. G. T. Milliette rendered assistance in the compilation of this material.

HEEL PRINTING IN FLAT FEET

A NEW METHOD FOR RECORDING THE DEGREE OF PRONATION

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ATLANTA, GA.

Since King described her efficient method of recording footprints,[1] I have used it almost daily. It furnishes the pediatrician with an inexpensive method of footprinting, the records of which are readily filed for future comparison.

There is little doubt that weak feet in small children is a matter which has been neglected by those having the greatest opportunity to correct the condition.

From the use of King's device it was soon apparent that the footprints did not tell the whole story of weak feet. Many feet have a tendency to roll in at the ankle; this condition will be referred to subsequently as pronation. These feet frequently show good longitudinal arches in the footprint records, but if the weakness at the ankle is not corrected, it will probably cause trouble later. This weakness is not apparent unless there is some record of the position of the heel. Then there are feet which, having a low longitudinal arch, give little trouble because there is no foot strain. It is probable that the pronated foot has much greater potentialities for harm than mere weakness of the longitudinal arch.

Normal feet should show an almost straight line drawn from the middle of the calf of the leg through the center of the heel. When there is weakness at the ankle with a tendency to roll inward, this line curves outward at the heel. The method to be described records the position of the heel and thus shows the degree of pronation.

Figure 1 illustrates the method of recording heelprints. *A* shows the feet of a child standing on the inked pad used in making footprints. The inked roller is passed up and down the posterior surface of the lower part of the legs and the heels in such a way as to leave a heavy deposit of ink. *B* shows the paper folded up against the heels after the child has stepped from the pad to the edge of the platform supporting the long sheet of wrapping paper. A second roller (uninked) is passed up and down, pressing the paper against the heels and leaving the impression seen in *C*, at the lower margin of the photograph.

This child has been wearing corrective shoes for more than a year and has good arches with "turned in" feet, but there is still a consider-

1. King, Helen: A New Method of Recording Children's Footprints, Am. J. Dis. Child. **43**:89 (Jan.) 1932.

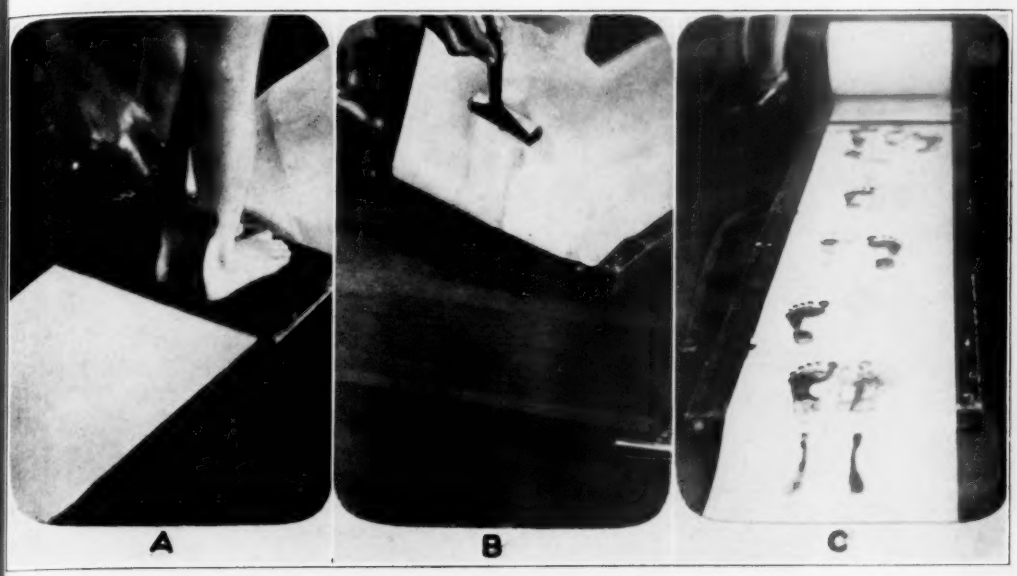

Fig. 1.—Method of recording heelprints.

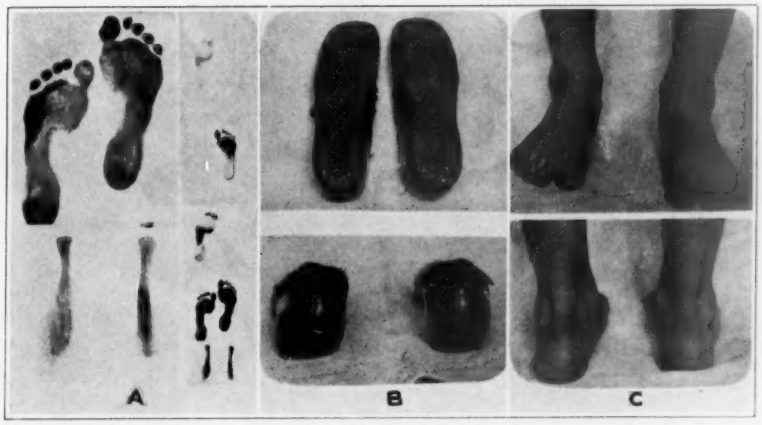

Fig. 2.—This child's feet caused considerable pain; pronation of the left foot is easily seen in the photographs of the heels.

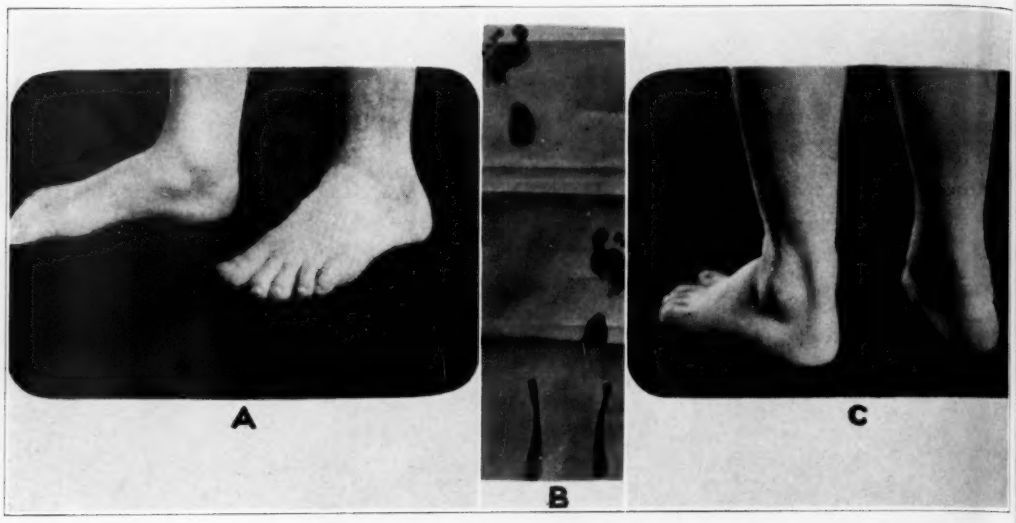

Fig. 3.—Photographs of feet with pes cavus.

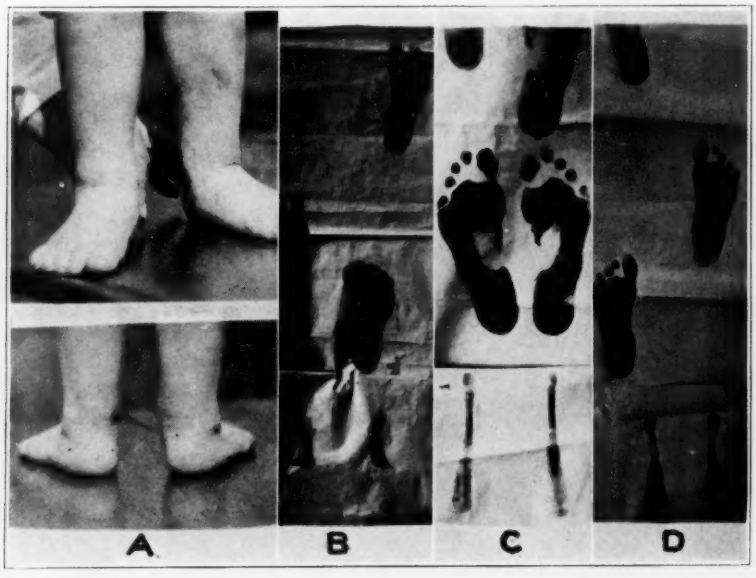

Fig. 4.—Feet with a considerable degree of weakness in the longitudinal arches and with much pronation.

able degree of pronation, as shown by the heelprints. Normal heelprints are shown in figure 4 *C*.

In figure 2 *C* are shown photographs of a child's feet which had caused considerable pain. The pronation of the left foot is easily seen in the photograph of the heels.

B shows the shoes. The left one is badly "run over" on the inside at the heel, and the sole is worn through on the inside, showing that the weight of the body is falling inside the optimum line (a line drawn from the center of the heel to the cleft between the great and the second toe) and therefore on the longitudinal arch.

A shows the footprints and heelprints. The weaker left foot shows a fairly good arch with some "hooking" where the forward surface of the arch is beginning to touch. The heelprints show that pronation is more marked on the left side, corresponding with the run-over shoe and the photographs of the feet.

Figure 3 shows photographs *A* and *C* of feet with pes cavus. The footprints *B* show the condition well, but the heelprints *B* give a more accurate idea of the pronation, which can readily be seen in the photographs.

Figure 4 *A* shows photographs of feet with a considerable degree of weakness in the longitudinal arches and with much pronation. *B* shows the footprints and the heelprints. *C* illustrates clearly the value of heelprints. The footprints of this child show considerable "hooking," or arches that are very low, yet she has never been troubled with her feet. The heelprints show practically no pronation or weakness in the ankles. Normal heels should show such lines, which are almost straight. *D* shows footprints with a greater degree of weakness in the right foot than in the left. This is well illustrated in the heelprint of the right foot, which shows more pronation.

SUMMARY AND CONCLUSIONS

Heelprinting, by the modified use of King's device, offers a simple, speedy and practicable method of recording weakness in the feet of children. This, when added to the information obtained from the walking footprints, gives an accurate idea of the condition of the child's feet at any given time. Comparison with subsequent records accurately reveals the progress in the correction of defects.

Case Reports

SALMONELLA SUIPESTIFER INFECTION IN A CHILD

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AND
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Infections in man by Salmonella suipestifer have been regarded as a rarity. The following report is of a child with a disease resembling paratyphoid fever from whose blood S. suipestifer was isolated.

REPORT OF CASE

History.—B. W., a 6 year old girl, was admitted to the James Whitcomb Riley Hospital on Dec. 3, 1931, complaining of fever and pain in the abdomen. Other members of the family had not been ill, and there had been no similar illness in the community from which she came. Later it was learned that several hogs on the farm where she lived had been sick with cholera at the time of the onset of her illness.

Her previous health had been excellent. She had had measles at the age of 2 years, with an uneventful recovery. There were no other previous illnesses.

The present illness began six days before admission with a chill, followed by fever. Pain in the abdomen began soon after the onset and continued almost constantly; it was never severe. The fever had continued, with some variation, during the time before admission. She had never appeared to be extremely ill, and at times asked to be allowed to get up. There was no rash at any time. The appetite had been poor since the onset, but there had been no vomiting or diarrhea.

Examination.—Physical examination at the time of admission revealed a well developed and fairly well nourished girl, who did not appear to be very sick. There was slight pallor. The throat was slightly inflamed. Over the lower lobe of the right lung there was slight dulness to percussion, with a slight diminution in intensity of the breath sounds, and numerous fine and coarse râles. The edge of the liver was palpable 4 cm. below the costal margin, but the spleen could not be felt. There were no other positive findings.

The temperature at the time of admission was 105 F. It gradually declined and became normal after two days in the hospital. The total duration of fever was eight days. The pulse rate during the febrile period in the hospital ranged between 100 and 120; so there was a slight relative bradycardia. The respiratory rate was never above 30 per minute.

An x-ray film of the chest revealed an elevation of the diaphragm on the right and rather marked accentuation of the hilar shadows on both sides.

From the Department of Pediatrics and the Central Laboratory, Indiana University School of Medicine, and the James Whitcomb Riley Hospital for Children.

On admission the blood count showed: red cells, 4,520,000; white cells, 4,350; hemoglobin (Newcomber), 71 per cent. A differential count showed: polymorphonuclears, 64 per cent; eosinophils, 1 per cent; lymphocytes, 24 per cent; large monocytes, 2 per cent; myelocytes, 4 per cent, and band cells, 5 per cent. The low white count persisted during the febrile stage of the disease.

A blood culture taken on December 4 revealed a motile gram-negative bacillus later identified as S. suipestifer.

The patient's serum did not agglutinate Bacillus typhosus or B. paratyphosus A and B, but did agglutinate the organism obtained from her blood up to 1:640.

The Mantoux reaction (0.1 mg.) was negative.

The urine was normal.

Unfortunately, no specimens of stool were examined.

With the fall in temperature she became entirely free from symptoms. Within a few days the liver decreased to normal size, and the physical signs of a pulmonary lesion disappeared. However, the changes in the lungs as shown by the x-rays did not disappear. The patient was discharged on December 16, thirteen days after admission.

On Jan. 28, 1932, the patient was returned to the hospital at our request for further study. There were no symptoms. Physical examination at that time revealed nothing abnormal. The Mantoux test was repeated, and again the reaction was negative. A blood culture was negative. Serum from blood drawn on January 28 agglutinated the organism isolated earlier up to 1:320.

A roentgenogram of the chest, taken on January 30, again showed increased hilar markings, with slight mediastinal widening.

The patient was again admitted to the hospital on March 21, this time with a furuncle in the right auditory canal. Examination at that time revealed no other lesion. A roentgenogram of the chest showed little if any change. Agglutination at that time gave a titer of 40 with strain B.W. and 10 with S. suipestifer 800.[1]

Bacteriologic Study.—As stated, the blood culture yielded a motile gram-negative bacillus hereafter referred to as strain B.W. Broth, agar slant and plate cultures had the growth characteristics of Salmonella suipestifer. Acid and gas were produced in twenty-four hours from dextrose, maltose, mannite, levulose, galactose, xylose, dextrin and sorbitol. Dextrin became alkaline after the initial acidity. Gas was not always produced from rhamnose, although it was acidified regularly. Acid was produced in glycerol in from one to seven days; no gas was formed. Dulcitol was fermented in from one to five days. Slight acidity was observed in arabinose in fifteen days, which gradually increased; no gas was produced. Lactose, sucrose, inulin, salicin, raffinose, inositol and adonitol were not attacked. The original strain acidified litmus milk, but did not alkalinize it later as S. suipestifer usually does. However, a strain recovered from the heart blood of a rabbit which died after inoculation with the strain B.W. did alkalinize milk after acidifying it.

The strain B.W. reduced nitrates to nitrites. Lead acetate agar was blackened within twenty-four hours. Indol was not formed, and gelatin was not liquefied. Standard methods recommended by the Society of American Bacteriologists were followed in the cultural studies.

Agglutination tests were made on serum obtained from a rabbit after five doses of killed bacilli of strain B.W. and from a rabbit immunized by six doses of killed organisms of S. suipestifer 800.[1] The antigens for these tests were grown on heart infusion agar, suspended in saline and killed with 0.1 per cent formaldehyde. From stock suspensions of the organisms antigens were prepared with a turbidity

1. Cultures obtained from the American Type Culture Collection.

of 500 parts per million. An incubation period of two and one-half hours at 37 C. was used, followed by storage in the refrigerator overnight. The highest dilution in which there was complete agglutination or almost complete agglutination was considered the titer. Antiserum of strain B.W. agglutinated the homologous organism, S. suipestifer 214 [1] and 800 [1] to a titer of 1 : 10,240, while with S. suipestifer 105 [1] a titer of 1 : 5,120 was obtained. B. paratyphosus B was agglutinated to a titer of 1 : 160. S. enteriditis 56,[1] 210 [1] and 535 [1] and B. paratyphosus A were not agglutinated. Serum from the rabbit immunized with S. suipestifer 800 agglutinated the homologous organism to a titer of 1 : 10,240, and strain B.W to a titer of 1 : 5,120.

The organism was quite virulent for rabbits. In the preparation of the immune serum that was used for the agglutination tests five doses of killed bacilli in gradually increasing amounts were injected intravenously into each of two rabbits, at five day intervals. One of the rabbits was bled five days after the last dose. Following this half an agar slant culture of living bacilli was given to each rabbit, and within forty-eight hours the two animals were dead. The organism was recovered from the heart blood of each animal in pure culture. At autopsy one rabbit had an enlarged spleen and a congested lung; the other had congestion of one lung with consolidation of the lower portion, hemorrhages in the thymus and mottling of the liver.

COMMENT

The strain B.W. differs from the typical S. suipestifer in its failure to alkalinize milk after acidifying it. However, a strain isolated from one of the rabbits did alkalinize milk after a preliminary acidity. Irregularities in the fermentative power of various strains of S. suipestifer are not uncommon. White [2] has pointed out particularly the irregularity of the fermentation of dulcite, such as we observed with our strain. Strain B.W. differs from the American type according to the classification of White, Dyke and Scott, in its action on dulcitol and arabinose and in its production of hydrogen sulphide.[3] It seems rather to belong to the European type "all the strains of which blacken lead acetate rapidly, seldom attack dulcite when first isolated, and rarely ferment arabinose." [3] It is of interest to note that these authors state that the European suipestifer bacillus seems particularly apt to attack young children and has been found to be the cause of febrile infections, gastro-enteritis and localized disease.

Because of the confusion that has existed as to the proper identification and classificiation of organisms in this group, it is difficult to determine which of the cases reported may be regarded as authentic examples of infection with Salmonella suipestifer. Bauer and McClintock,[4] in

2. White, P. B.: Further Studies on the Salmonella Group, Medical Research Council Special Report Series, no. 103, London, His Majesty's Stationery Office, 1926.

3. Savage, W. G., and White, P. B.: An Investigation of the Salmonella Group, Medical Research Council, Special Report Series, no. 91, London, His Majesty's Stationery Office, 1925.

4. Bauer, J. T., and McClintock, M.: Fatal Septicemia in Man Due to Bacillus (Salmonella) Suipestifer, J. Infect. Dis. **44**:292 (April) 1929.

reporting a fatal case of their own, reviewed the literature up to that time, and stated that "the paratyphoid infections reported by Longcope [5] were probably due to B. suipestifer (Ten Broeck [6]). Many of the so-called B. paratyphoid C infections, reported by Heimann,[7] Hirschfeld,[8] MacAdam [9] and Wordley [10] have been found to be due to B. suipestifer (Savage and White).

"The more recent accounts by Mackenzie,[11] Krumwiede, Provost and Cooper,[12] Duncan,[13] Scott,[14] Shaw,[15] Stewart and Litterer [16] were probably due to organisms belonging to the first group of Jordan's classification, namely, B. suipestifer. It is to this group, we believe, that the organism from our case belongs."

A review of the case histories in the foregoing reports reveals the fact that there is a considerable variety in the clinical pictures produced as a result of infection with suipestifer.

The patient in the case reported by Longcope [5] had a disease very much like typhoid fever, including a leukopenia. At autopsy, there were congestion and edema of the lungs, an acute splenic tumor, parenchymatous degenerations of the liver and spleen and congestion of the brain.

Heimann [7] reported ninety-one cases of food poisoning occurring as a result of eating raw or partially cooked chopped meat. The incubation period varied from one to twenty-four hours. They presented the

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5. Longcope, W. T.: Paracolon Infection, Together with the Report of a Fatal Case, with Autopsy, Am. J. M. Sc. **124**:209, 1902.

6. Ten Broeck, C.: Bacilli of the Hog Cholera Group (B. Cholerae Suis) in Man, J. Exper. Med. **32**:33, 1920.

7. Heimann, W.: Ueber die durch einen genannten "Paratyphosis C" Bacillus verursachte Fleischvergiftungsepidemie im Hildesheim in Frühjahr 1911, Centralbl. f. Bakt. (Abt. 1) **66**:211, 1912.

8. Hirschfeld, L.: A New Germ of Paratyphoid, Lancet **1**:296 (Feb. 22) 1919.

9. MacAdam, W. A.: An Infection in Mesopotamia Due to a Bacillus of the Gaertner-Paratyphoid Group, Lancet **2**:189 (Aug. 2) 1919.

10. Wordley, E.: A Case of Fever Due to B. Paratyphosus C, Brit. M. J. **2**:105, 1923.

11. Mackenzie, J.: Infection of Man by an Organism Closely Allied to Bacillus Suipestifer (Hog Cholera), J. Roy. Army M. Corps **39**:51, 1922.

12. Krumwiede, C.; Provost, D. J., and Cooper, G. M.: Studies on the Paratyphoid-Enteriditis Group: VII. Enteric Infection ("Food Poisoning") Due to Tapioca Pudding Contaminated with B. Cholerae Suis (B. Suipestifer), J. M. Research **43**:53, 1922.

13. Duncan, J. T.: A "New" Salmonella from a Case of Enteric Fever, J. Hyg. **22**:402, 1924.

14. Scott, W. M.: Food-Poisoning Due to Bacillus Suipestifer (Sub-Group II), J. Hyg. **25**:406, 1926.

15. Shaw, F. W.: An Infection of Man Probably Due to Salmonella Suipestifer, J. Lab. & Clin. Med. **12**:141, 1926.

16. Stewart, H. C., and Litterer, W.: An Outbreak of Gastro-Enteritis, J. A. M. A. **89**:1584 (Nov. 5) 1927.

usual symptoms of fever, with vomiting, diarrhea and severe abdominal cramps. Two patients were jaundiced. Marked lassitude was a notable feature.

In nineteen cases reported by Hirschfeld,[8] the patients had a disease which resembled paratyphoid fever.

MacAdam [9] reported nine cases, from seven of which he recovered S. suipestifer in the course of routine blood culture and from two others at autopsy. With his cases the fever was usually of abrupt onset and variable duration, the patients with mild cases recovering in from five to seven days. The fever was intermittent in some and continuous in others. He comments on the marked involvement of the respiratory system, including a bronchitis, in all but three of his cases. Two of those without respiratory symptoms were regarded as having enteric fever. One patient, because of continued bloody diarrhea, was thought to have dysentery. The patient with the dysentery-like disease died and was found at autopsy to have hemorrhages in the small intestine, and erosions and small hemorrhages in the colon. The organism was found in the heart blood and the spleen. Two other patients died of rather extensive lobar pneumonia. Suipestifer was isolated from the lungs of both at autopsy, and no pneumococcus was found.

Wordley [10] reported the case of a child who showed fever of gradual onset, with cough and a slight diarrhea. There were scattered areas of consolidation in the lungs. The spleen was not enlarged, and there were no rose spots. Leukopenia was present. The febrile period lasted ten days, and was followed by uneventful recovery. Suipestifer was recovered from the blood.

The case reported by MacKenzie [11] showed recurring fever, lasting eleven days in all, associated with nasal discharge and bronchitis. The organism was grown from the blood.

Krumwiede, Provost and Cooper [12] described an outbreak of typical food poisoning in one family, with one death. The infection with suipestifer was traced to tapioca, which may have been contaminated from pork.

Duncan [13] reported the case of a seaman who presented the common signs of typhoid fever. The patient had two intestinal hemorrhages, and then made an uninterrupted recovery. Suipestifer was grown from the blood.

Scott [14] described four separate outbreaks of food poisoning in which the infecting organism was found to be suipestifer. There was one death in a 15 month old child.

Shaw [15] reported the case of a patient who had an acute onset of illness, with cough, rusty sputum and signs of pulmonary involvement. The disease ran the usual course of pneumonia, and death ensued four days after the onset. The white blood cells were moderately increased

(15,000 per cubic millimeter, with a predominance of polymorphonuclears). At autopsy, there were bilateral chronic adhesive pleuritis, bilateral chronic interstitial pneumonia and multiple acute septic infarcts in the left kidney.

Stewart and Litterer [16] reported a widespread milk-borne epidemic of food poisoning due to suipestifer. Thirty per cent of the patients were children.

The case reported by Bauer and McClintock [4] resembled typhoid fever. There was a gradual onset of fever, with lassitude and an unproductive cough. Petechial hemorrhages were present in the conjunctivae, but there were no rose spots. A few râles were heard over the lower part of the chest, but there was no consolidation. The abdomen was distended. The liver and spleen were enlarged. Leukopenia (6,000 per cubic millimeter) was present. Fever was continuous in type. Later a bilateral bronchopneumonia developed, and the patient died. Three blood cultures were positive for suipestifer.

In addition to the cases covered by Bauer and McClintock's summary of the literature, the following case reports have been found.

Bullowa [17] reported a case of typical lobar pneumonia involving the right middle lobe. The white blood count was 12,000 per cubic millimeter, with a predominance of polymorphonuclears. Culture of the sputum yielded suipestifer and no pneumococci. The same organism was obtained by blood culture and by postmortem lung puncture.

Nabarro, White, Dyke and Scott [18] reported two cases. One patient, an 8 months old child, had lost the use of both arms during the course of an illness of two months' duration. There was swelling of both shoulders, and x-ray films showed periosteal thickening and some erosion. Aspiration of the right shoulder yielded 1 cc. of thin fluid from which S. suipestifer was grown. The other patient had a sudden onset of illness with malaise and deafness. Fever developed, and two days after the onset delirium was present. Later a few râles developed over the apex of the right lung, and, one day before death, one large purpuric area appeared in the flank. A blood culture was positive for S. suipestifer. At autopsy, there was evidence of a generalized infection, with purpuric flecks on the pleura and heart.

Geiger, Greer and White [19] reported a case of food poisoning, apparently due to suipestifer, caused by the eating of infected crab meat.

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17. Bullowa, J.: Bacillus Suipestifer (Hog Cholera) Infection of the Lung, M. Clin. North America **12**:691 (Nov.) 1928.

18. Nabarro, D.; White, P. B.; Dyke, S. C., and Scott, W. M.: Two Cases of Human Infection by the American Hog Cholera Bacillus, Lancet **2**:868 (Oct. 26) 1929.

19. Geiger, J. C.; Greer, F. E., and White, J. L.: Outbreak of Food Poisoning Probably Due to Crab Meat, U. S. Nav. M. Bull. **27**:265 (Jan.) 1929.

Branham, Motyea and Devine [20] reported a case, with the illness apparently beginning with a heat stroke, followed by fever, chills and difficulty in urination. The temperature was septic. Râles were heard over the bases of both lungs. The white blood count was 6,200, with 75 per cent polymorphonuclears. A blood culture was positive for S. suipestifer. Later a periurethral abscess was opened, and a fistula developed. Culture from this was positive for B. coli. Still later a bilateral parotitis due to Staphylococcus aureus developed, and the patient died. At autopsy, there were small hemorrhages and abscesses in the kidneys and fibrous adhesions involving the pleural surfaces of both lungs.

Schmidt [21] reported an epidemic of food poisoning in thirty-six people who had eaten pork sausage. Suipestifer was isolated from the stools of the patients and from the sausage eaten.

Kopp [22] reported the case of a patient who had a severe febrile illness, associated with pain, swelling and redness of the jaw, and from whose blood suipestifer was isolated.

Roth [23] reported the case of a young woman in whom, shortly after childbirth, an illness developed during which she had occasional chills and fever. Eventually, after a long illness, a pleural exudate developed. Suipestifer was grown from the pleural fluid. Following drainage, the patient recovered.

Boller [24] described several groups of cases in which the illness was apparently associated with infection by suipestifer. In eight cases, after the eating of meat from which S. suipestifer was isolated, there was an illness lasting from four to six weeks, in which there were abdominal pain, vomiting, fever, headache and lassitude. Constipation was present at first, but later diarrhea developed. In the more severe cases the spleen became enlarged after from two to three weeks. Some of the patients had bronchitis, and one of them had pneumonia. Cultures from the patient's blood, urine and stools were not positive for suipestifer. In another group, four people in one family became ill, one with a typhoid-like condition, the other three with vomiting and diarrhea after eating meat infected with suipestifer. Blood, urine and stool cultures

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20. Branham, S.; Motyea, L. J., and Devine, C. J.: Bacteremia Due to Salmonella Suipestifer, J. A. M. A. **94**:1758 (May 31) 1930.

21. Schmidt, F.: Zur Frage der Pathogenität des Bacillus suipestifer, Centralbl. f. Bakt. (Abt. 1) **108**:276, 1928.

22. Kopp, R.: Zur Frage der Menschenpathogenität des Bacillus suipestifer, Deutsche med. Wchnschr. **52**:2156, 1926.

23. Roth, O.: Ueber eine Beobachtung von puerperaler Bacillus suipestifer-Infektion von septischem Charakter, Med. Klin. **24**:1828 (Nov. 23) 1928.

24. Boller, E.: Ueber Erkrankungen beim Menschen durch Bakterium suipestifer, Schweiz. med. Wchnschr. **2**:1935, 1930.

were negative, and the organism was isolated only from the meat. In another patient, who had a severe gastro-enteritis, paralysis developed on the fourth day of the illness. The paralysis was described as resembling that sometimes seen after diphtheria. It lasted several weeks. On the third day of the illness, one day before the development of paralysis, the blood culture was positive for suipestifer. Later blood cultures were sterile. Severe gastro-enteritis developed in another patient. Suipestifer was isolated during the disease, and agglutinins were present in the patient's blood. In another group, four members of the same household had a severe illness, associated with diarrhea and fever, which lasted about ten days. Suipestifer was isolated from the stools of two of these patients, and from the meat eaten just before the illness. The patient's blood agglutinated B. suipestifer.

Two other patients, a man and his wife, had a severe gastro-enteritis and high fever. The man died after eight days, and at autopsy showed lesions like those found in paratyphoid fever. Suipestifer was isolated from the bile and intestinal contents. The woman slowly recovered. The same organism was isolated from the stool.

Another group of eight people, all of whom ate the same meal, became ill with an acute diarrhea and fever, which lasted from three to four days. S. suipestifer was isolated from the pork eaten and was agglutinated by the patient's serum.

SUMMARY

It is apparent from this review of the cases described in the literature and the one reported here that infection with S. suipestifer does not produce any one characteristic clinical picture. Most commonly the gastro-intestinal tract has been attacked. The symptoms and signs when this occurs sometimes resemble those of so-called food poisoning, such as is frequently caused by S. enteriditis; sometimes they are like typhoid or paratyphoid fever, and, in one case reported, the disease resembled bacillary dysentery. Next in frequency is involvement of the respiratory tract, where the infection may manifest itself as a bronchitis or as bronchopneumonia or lobar pneumonia. Symptoms referable to both the gastro-intestinal and the respiratory tracts may occur together, as happened in the case reported here. In addition to these more common manifestations, single examples have been reported of suppurative arthritis, sudden deafness, inflammation of the soft tissues around the jaw, puerperal infection with pleural effusion, peripheral neuritis and infarcts of the kidneys. Since infection with S. suipestifer can apparently cause a considerable variety of clinical manifestations, it seems advisable that in the investigation of any case of obscure fever, especially those associated with gastro-intestinal symptoms, bacteriologic studies should be carried out with particular reference to this organism.

PAROXYSMAL HEMOGLOBINURIA

TREATMENT BY THE INOCULATION OF SPIROCHAETA MORSUS-MURIS

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It is well known that with some remedies, e. g., arsphenamine, mercury, bismuth and iodide of potassium, several years of continuous administration are required to ensure complete recovery from paroxysmal hemoglobinuria. Recently, S. Inamori of the department of pediatrics at Manchuria Medical College reported that the inoculation of Spirochaeta morsus-muris brings about complete cure in cases of hemoglobinuria in a short period. About ten months elapsed after the treatment of the patient before Inamori was able to confirm his statements, because the patient did not visit the hospital for a long time after the treatment was completed. Lately, there has been another opportunity to use this treatment in a similar case, and the result was so striking that it seems to be worth while to report it in full.

REPORT OF A CASE

History.—S. M., a girl, aged 4¾ years, was admitted to the hospital on Oct. 29, 1931. Both parents were healthy, and she had two healthy brothers. The mother had had no abortions. The patient was the third child, and was born easily at the end of the full term. Her past history was unimportant.

During the last two winters, whenever the child caught a cold, she used to complain first of thirst. This was followed by prostration, pallor and swelling, pain, and cyanosis of the backs of the hands and feet, accompanied by fever, and finally the passing of reddish-brown urine. The aforementioned symptoms usually disappeared after about half an hour or so, when the patient stayed in a warm place.

Examination.—The structure and the general nutrition of the patient were normal, except that she was very pale. The cubital lymph nodes on both arms were swollen to the size of the lens of an eye. The thorax was normal. The liver was palpable at 0.5 cm. beneath the border of the ribs; the spleen was palpable and its consistence was normal. The child had many decayed teeth. There were no signs of syphilis or edema. The knee reflexes were normal. The temperature was 36.9 C. (98.4 F.); the pulse was full and regular and registered 110. The respirations were 32. The weight was 14,550 Gm. The urine was yellow, clear and acid. There were a trace of albumin and a few leukocytes.

Course.—October 31: The Wassermann reaction was 4 plus; Murata's reaction, 3 plus, and Meinicke's reaction, 1 plus.

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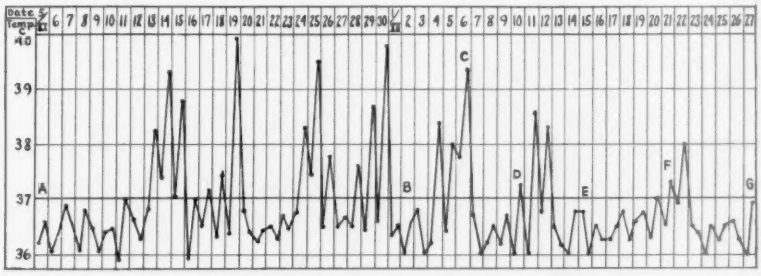
November 3: Ehrlich's chilling test was performed by immersing the feet in cold water at from 4 to 5 C. for half an hour. Forty minutes after the test, a red urine containing hemoglobin and albumin but without sediment was passed. The temperature rose to 38.9 C. (102 F.).

November 4: The test of hemolysis by Donath and Landsteiner's method gave a strong positive result.

November 5: The patient was inoculated intramuscularly at the hip with the blood serum of a guinea-pig which had previously been infected by rat-bite fever. One cubic centimeter of blood was taken from the animal, mixed with 0.3 cc. of a sterilized 1 per cent solution of sodium citrate and 0.7 cc. of physiologic solution of sodium chloride. The mixture was centrifugated slightly for the purpose of collecting the spirochetes. Five-tenths cubic centimeter of the upper part of the mixture was used.

November 13: The child had fever for the first time, and her temperature rose to 38.2 C. (100.8 F.). The inoculated area was slightly red, infiltrated and painful on pressure. For three consecutive days the temperature fluctuated between 37 and 39.3 C. (98.6 and 102.7 F.). Then two days without fever followed.



Temperature chart. *A* indicates inoculation of Spirochaeta morsus-muris; *B*, *C*, *D*, *E* and *F*, the injection of sulpharsphenamine, and *G*, a negative reaction to Ehrlich's test.

November 19: The highest temperature was 39.9 C. (103.8 F.). The inoculated area was the same as before. On the next day the fever disappeared, and for the following four days the temperature was normal.

November 24: The child was feverish for three days, the highest temperature being 39.5 C. (103.1 F.). The spleen was palpable, of normal consistence and 3 cm. beneath the costal margin.

November 28: The patient was again feverish for three days, with the highest temperature at 39.8 C. (103.6 F.). The inoculated area was slightly reddish purple, but not painful on pressure. The face was slightly edematous. The urine was yellow and slightly turbid. Albumin, leukocytes, erythrocytes, epithelioid cells and granular casts were present.

December 2: An intramuscular injection of 0.015 Gm. of sulpharsphenamine was given. The weight was 13,100 Gm.

December 4: The child was feverish for the following three days, the highest temperature being 39.3 C. (102.7 F.).

December 6: A similar injection of 0.02 Gm. of sulpharsphenamine was given. The inoculated area showed no more trace of infiltration.

Dec. 10: An injection of 0.05 Gm. of sulpharsphenamine was given intramuscularly. For three consecutive days the patient had fever of an irregular type. The urine was yellow. Analysis showed no albumin; erythrocytes, leukocytes and a few epithelial cells were present; there were no casts.

December 15: Another injection of 0.075 Gm. of sulpharsphenamine was given. The child weighed 14,150 Gm. The urine was yellow and clear. Analysis showed: no albumin, a few erythrocytes and leukocytes and no epithelial cells or casts.

December 21: One-tenth gram of sulpharsphenamine was injected. The child weighed 14,800 Gm. Both cubital lymph nodes had disappeared.

December 22: The temperature rose to 38 C. (100.4 F.), but fell to normal during the day and remained so until the patient left the hospital.

December 27: The result of Ehrlich's test was negative.

December 28: The Wassermann reaction was 3 plus; Murata's reaction, 3 plus, and Meinicke's reaction, 1 plus. The patient was fairly well nourished, but rather pale. She felt vigorous and had a good appetite. The spleen was palpable at the costal margin. The urine was clear and yellow. Albumin and sediment were normal. The child was discharged from the hospital.

Feb. 27, 1932: The child visited the clinic. Since her return home she had been completely well, except for an attack of measles in the middle of January. She no longer passed red urine.

On examination, nothing of special importance was found, except that the spleen and cubital lymph nodes were no longer palpable. The urine was normal. The test of hemolysis by Donath and Landsteiner's method and Ehrlich's chilling test gave negative results. The Wassermann reaction was 3 plus; Murata's reaction, 3 plus, and Meinicke's reaction, 1 plus.

COMMENT

The patient, after suffering from paroxysmal hemoglobinuria the past two winters, was cured completely in a short time by an inoculation of Spirochaeta morsus-muris. Her recovery has been proved not only by the fact that she does not have hemoglobinuria as in previous winters, but also by the results of the several examinations. The absence of hemoglobinuria, however, was confirmed on the fifty-third day of treatment. The nephritis which resulted from the treatment was slight, and after a short time it disappeared completely. However, the biologic reactions of the blood serum due to syphilis remained unchanged until the day of discharge and lasted for two months. A statement that complete cure of the syphilis has been obtained must be postponed, because, according to many investigators, positive reactions frequently do not disappear until a year after treatment.

SUMMARY

In a case of paroxysmal hemoglobinuria of two years' standing cure was obtained within fifty-three days by means of six periods of intermittent fever produced by the inoculation of Spirochaeta morsus-muris.

ADDENDUM

On June 24, 1932, the boy referred to in the introduction to this paper, who was treated by S. Inamori two years ago, visited the clinic, and reported that the hemoglobinuria had never recurred. Contrary to expectation, Ehrlich's chilling test gave a positive result this time, but the Wassermann reaction was positive and Murata's and Meinicke's reactions were negative.

It seems that in this case syphilis is gradually disappearing, but that hemoglobinuria is present in a slight degree. Apparently it will be necessary to devise some other means of bringing about a complete cure.

Progress in Pediatrics

COPPER AND ANEMIA

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Steenbock, Hart and their co-workers have made a series of systematic investigations on the catalytic effect of copper on hemoglobin formation. In Europe a great part of any interest in the present article would be due to the fascinating history of this important discovery. In America, no doubt, all pediatricians are familiar with the facts which led to this contribution to science; however, I shall make a brief survey of these investigations, because sometimes discoveries are not as well known in the country in which they are made as abroad. Let me thus begin with the transport of owls to Athena.

The subject of these investigations was interesting to pediatricians, as it dealt with the nutritional anemia due to the exclusive feeding of milk.

In the first period of the investigations, rabbits from 4 to 5 weeks of age were placed on a milk diet. After five or six weeks they became anemic. Development of the disease was prevented by adding 50 Gm. of fresh cabbage to the milk diet. The cabbage contained some iron, possibly in an active form. It soon appeared that inorganic iron in the form of ferrous carbonate was not capable of preventing anemia in milk-fed young rabbits, even when it was given in much larger amounts. An alcoholic extract of cabbage was therefore given to determine whether some organic substance had a vitamin-like action on anemia. Although practically free from iron the alcoholic extract was effective when it was given together with iron in inorganic form, which was itself inactive. Extract of lettuce, cornmeal and chlorophyll prepared from tomato leaves were equally effective.

These results seemed to corroborate the conclusion that an organic compound—free from iron—could prevent anemia. If this was the case, all the effectiveness of lettuce would be destroyed by incineration. When the ash of 5 Gm. of lettuce or cabbage was added to a diet of milk and inorganic iron, the anemia that had been produced by the diet was cured in thirty days.

In further experiments the use of ash preparations was continued in young rats. First, hydrochloric acid extracts of the ash were prepared. Whereas ferric chloride was inactive, the hydrochloric acid

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extracts of the ash prepared from lettuce, corn or liver (a very active food) appeared to be strongly active in preventing anemia caused by the exclusive feeding of milk.

Chemical methods were used for the separation of different minerals in the ash. On the addition of sulphureted hydrogen to a hydrochloric solution of the ash, an active precipitate, free from iron, was obtained. A precipitate obtained with ammonium sulphide was inactive, as was the filtrate.

Before this phase of the experiment was reached one rat was given copper sulphate, because the blue color of the active ash of lettuce had attracted attention. The animal was rapidly cured by this addition.

By the ingestion of 10, 50 and 100 micrograms of copper a day anemia in young rats was rapidly cured. In the active ash of liver not less than 50 micrograms of copper was given daily.

The precipitate formed by adding hydrogen sulphide to the ash was further analyzed. The copper was extracted from it electrolytically and this copper and the remaining fluid were given to anemic animals. Only the copper proved to be effective.

A series of experiments in which different amounts of copper, either in inorganic form or from organic sources, were given showed that even 1 microgram of copper daily was sufficient to cure nutritional anemia. No other element had any effect on anemia except arsenic, the action of which was only temporary and of little importance.

I now come to the important point of my study: Is the anemia which is due to exclusive feeding of milk in infants to be ascribed to a lack of copper?

Nutritional anemia is seen more often in twins and premature children than in others. The age of the patient is usually between 6 months and 2 years. The condition is rarer after breast feeding than when cow's milk has been given. I agree with Scheltema that anemia is produced with greater facility by goat's milk than by cow's milk. It is probably more frequent in rural than in urban districts. Nutritional anemias usually show an oligosideremia, with less diminution in the number of erythrocytes than in the hemoglobin content of the blood, owing, for the most part, to the smaller size of the erythrocytes.

Nutritional anemia is easily cured by the addition of vegetables, fruit or meat to the diet, as well as by the use of iron preparations such as ferrous lactate or ferrous oxalate. However, as Czerny has emphasized, cure is always slow if cow's milk continues to be given in large amount. The quantity should be diminished considerably as other foodstuffs are added to the diet.

It is obvious that all the clinical peculiarities of this type of anemia cannot be explained by the theory of a deficiency of copper. From the experiments that I have selected it is certain that milk is poor in

iron and copper, and that the lack of both these elements is a factor in the production of nutritional anemia in animals. It is, however, interesting to study the copper content somewhat more closely. In agreement with Elvehjem and others I concluded that most of the recorded figures on the copper content of milk are wrong and that certified milk contains very little copper—from 0.12 to 0.18 mg. per liter (table 1). The figures given by other observers, however, may also be correct, and the variations may not be caused solely by differences in technic.

TABLE 1.—*Copper Content of Cow's Milk: Findings of Various Authors*

Authors	Copper, Mg. per Liter
Fleurent and Lévy	1.4
Guerithault	0.6
Bertrand	0.5
Supplee and Bellis	0.2-0.8
Supplee, Dow, et al.	0.5-0.75
Quam and Hellwig	0.26-0.52
McHargue	0.38
Drabkin and Waggoner	0.32
Elvehjem and Steenbock	0.12-0.18

TABLE 2.—*Copper Content of Cow's, Goat's and Breast Milk*

	Copper, Mg. per Liter
Cow's milk (certified)	0.14 0.13 0.12 0.10 0.09
Goat's milk	0.17 0.10 0.15 0.14
Breast milk	0.22 0.28 0.25 0.21

During the handling of milk an increase in its copper content takes place. After pasteurization the amount of copper is often doubled (as was also observed by Meerburg). Buttermilk from a milk factory was found to have a high content of copper, whereas buttermilk prepared from certified milk in aluminum vessels in the milk kitchen of the clinic had a low content.

Goat's milk contains little copper, but not less than cow's milk. If the production of anemia by the feeding of goat's milk is to be attributed to the low copper content, the only possible explanation is that goat's milk is hardly ever—at least in the Netherlands—sent to a milk factory, and that it is not pasteurized in tinned copper vessels. In this respect certified milk would be as poor a food as goat's milk. This explanation is in accordance with the greater frequency of nutritional anemia in rural districts.

Breast milk, which produces anemia much less frequently than cow's or goat's milk does—although it can produce the condition—contains more copper than either of these animal milks.

One must not forget, however, that before the copper can be considered of practical importance, the iron content of the milk product should also be known. It is improbable, however, that this would be

TABLE 3.—*Copper Content of Various Milks and Milk Products*

	Copper, Mg. per Liter
Cow's milk	0.12
Goat's milk	0.15
Breast milk	0.24
Buttermilk (home-made)	0.11
Milk before pasteurization	0.125
Milk during pasteurization	0.22
Milk 2 hours after pasteurization	0.18
Buttermilk from milk factory	0.35* 0.45* 0.29*

* Findings of Dr. Grendel.

TABLE 4.—*Copper Content of Various Foodstuffs* *

	Copper, Mg. per 100 Cc.		Copper, Mg. per 100 Cc.
Sugar	0.01	Bananas	0.08
Wheat flour	0.15	Potatoes	0.10
Rice flour	0.15	Spinach	0.08
Rice	0.22	Cabbage	0.16
Biscuits	0.17	Meat	0.18
Eggs	0.09	Liver	0.51
Oranges	0.15		

* Findings of Dr. Grendel.

TABLE 5.—*Copper Content of Various Iron Preparations* *

	Copper, Mg. per Gm.
Ferrous sulphate	<0.002
Ferrous lactate	0.005-0.006
T. I. ferri pomat.	0.030-0.035
Reduced iron	0.009-0.011
Saccharate of iron (10%)	0.060-0.080
Pulverized iron	0.060-0.075

* Findings of Dr. Grendel.

much altered by pasteurization. The figures given in the literature indicate little change in value.

It is hardly necessary to state that vegetables, fruit and meat, which are known to be effective in curing anemia, are rich in copper.

That the addition of iron preparations to the diet is not always sufficient to cure anemia is possibly due to their low copper content, and it would seem probable that the divergence of opinion with regard to the effectiveness of iron as the sole medicament in this type of anemia may be explained by large differences in the copper content of the iron preparations used by various clinicians.

All these facts can be considered in harmony, to a certain extent, with the present theory without furnishing new evidence to support it. It is possible that in the anemia of infants other factors are present than exist in the anemia of animals.

One could go further in this investigation, giving pure iron to anemic babies in the first period of observation and copper with the iron in the second period. I do not approve of such an experiment on children, however, because it would probably result in a persistence of the anemia during the first period. It is probable that 0.1 mg. of copper is insufficient to prevent anemia in infants.

There is another aspect of nutritional anemia. Can hypochromic anemia in infants be explained by the theory of a deficiency of copper? Observations on animals do not permit this conclusion. In rats nutritional anemia due to the exclusive feeding of milk is of the hypochromic type. It is not known, however, whether the condition is due to a lack of iron or of copper, because recent reports of such experiments have not given the number of erythrocytes.

TABLE 6.—*Copper Content of Normal Blood*

	Copper, Mg. per Liter
Warburg and Krebs' serum	0.91
Schönheimer and Oshima	1.21 1.44 1.44
Grendel and Weyers (7 determinations)	1.41
van Ormondt (20 determinations)	1.2

Clinical observations have been made that, so far as I see, cannot be explained by the hypothesis that a lack of copper plays an important rôle in nutritional anemia. There is no evidence that twins or premature children have less copper than full-term infants. There is reason to believe that the contrary is true, as Krauss found that the fetal liver contains more copper than the liver of the new-born infant. Also the observation, first recorded by Czerny, that anemia is not cured when much milk is added to a complete diet, is in direct contradiction to the theory of a lack of copper and is also incompatible with the hypothesis of a deficiency of iron, for if a food deficient in a certain constituent is given in increased amount its effect should be the same, and not more detrimental. The result might be explained by assuming that the milk causes destruction of blood, a view that is held by Glanzmann. I am inclined, however, to prefer another hypothesis based on studies of calcium metabolism. These show that calcium retention is less complete when much milk is given, and the explanation of this paradox is found in the influence of large amounts of cow's milk on the absorption of calcium. It is now almost certain that the negative calcium balance is

produced by the alkaline reaction of the intestinal content, which is produced by the putrefaction of the proteins of the milk and the production of ammonia. If these facts are applied to the study of iron metabolism, it is possible to explain the paradoxical influence of milk on anemia along the same lines. This effect, however, will remain completely hypothetic until experimental evidence is produced.

Thus some facts are now better explained, perhaps, than before the influence of copper on the production of anemia was known, but other facts are not. Unfortunately, it is necessary to cite observations which,

TABLE 7.—*Copper Content of Whole Blood in Normal Adults* *

Name	Age	Sex	Copper, Mg. per Liter	
F. B.	26	M	1.0	1.0
K. v. S.	25	M	0.9	0.9
A. v. O.	25	F	2.1	2.0
W. S.	26	M	1.5	1.5
J. v. O.	31	M	1.2	1.1
M. S.	20	F	1.0	...
D. S. F.	30	F	1.2	...
S.	23	M	1.2	1.0
J. M.	40	M	1.2	1.2
W. S.	26	M	1.2	1.0
X.	..	..	0.9	1.0

* Findings of Dr. van Ormondt.

TABLE 8.—*Copper Content of Whole Blood Under Various Conditions* *

	Copper, Mg. per Liter
New-born	1.0
Normal	1.4
Pregnancy	1.9
Infections	2.1
Anemia	2.1

* Findings of Drs. Grendel and Weyers.

at first sight, seem to contradict the theory that the anemia noted in children fed with cow's milk is due to a lack of copper.

My co-workers and I have tried to prove the importance of this deficiency of copper in clinical anemia by determining the copper content of the blood in nutritional and other forms of anemia in the normal state and in infectious diseases. If the deficiency of copper is one of the causative factors in nutritional anemia, the copper content of the blood should be lowered in this condition as the iodine content is lowered in myxedema. Pure forms of nutritional anemia are rare, but we have met with some. In these, as in all other forms of anemia, we found exactly the reverse of what we expected: The patients showed a higher level of copper in the blood than did normal persons of the same age. This fact had already been observed by Warburg and Krebs, who showed that in pigeons bleeding has the effect of increasing the copper content of the blood.

It is possible to reconcile this result with the theory that in children cases of anemia are encountered which are caused by a lack of copper. It has been shown by Elvehjem and Sherman that if anemic rats are given pure inorganic iron the iron content of the liver is increased, and the hemoglobin of the blood is not modified. The further addition of

TABLE 9.—*Copper Content of Whole Blood* *

Date	Hemoglobin, Gm. per 100 Cc.	Erythrocytes	Copper, Mg. per Liter	
9/11/32	9.2	3,930,000	1.8 >1.5	13 M.
10/ 1/32	13.8	5,500,000	1.0 1.3	
1/21/32	5.9	4,050,000	1.7	10 M.
7/ 1/32	9.0	4,280,000	1.8 1.8	

* Findings of Dr. van Ormondt.

TABLE 10.—*Copper Content of Whole Blood* *

Hemoglobin	Copper, Mg. per Liter
35	2.8
37	1.6
29	2.4
55	2.6
35	1.9
35	2.0
47	1.7
47	1.7

* Findings of Dr. Grendel.

TABLE 11.—*Copper Content of Whole Blood* *

Name	Date	Age	Sex	Hemoglobin	Erythrocytes	Copper	
M. K. L.	Sept. 11	18 mos.	F	49	4,870,000	1.7	1.8
A. K. O.	April 28	1 yr.	M	64	4,820,000	1.8	1.8
T. H. Z.	.....	6½ mos.	M	28	2,530,000	1.6	1.5
G. J. D. H.	July 2	.....	M	..	.....	1.9	1.7
K. P. A.	Nov. 3	10 yrs.	M	36	4,670,000	1.2	1.2
E. V. H.	Nov. 14	3½ yrs.	F	..	.....	1.4	1.4
N. S.	Dec. 28	2 yrs.	M	54	4,380,000	1.9	1.7
P. V. D.	Dec. 27	4 wks.	M	25	1,800,000	2.0	2.0

* Findings of Dr. van Ormondt.

copper produces a mobilization of the iron from the liver and a rise in the hemoglobin content. If copper is necessary to produce this effect, not only in the liver but in other organs (bone marrow), one understands why the copper content of the blood is increased in anemia. The production of hemoglobin requires a certain amount of copper, and its increased production in anemia requires more copper, which is transported by the blood stream.

Whether this copper is fixed in the cells of the blood or is free in the plasma is not known. From observations (Dr. van Ormondt) made in my clinic it seems that the cells and plasma contain the same amount of copper. We also showed, by a determination on the col-

TABLE 12.—*Copper Content of Whole Blood of Sheep* *

	Copper, Mg. per Liter
Whole blood	1.1 1.0 1.0 1.0
Plasma	0.5 0.7 0.7 0.7 0.6 0.6
Cells	0.3 0.4 0.2

* Findings of Dr. van Ormondt.

TABLE 13.—*Observations on the Blood in a Child (Ju. St.) Aged Three and a Half Years, with Leukemia* *

Hemoglobin	4.7 Gm.
Erythrocytes	2,190,000
Leukocytes	600,000
	Copper, Mg. per Liter
Whole blood	1.9
Plasma	1.6
Leukocytes	0.38
Erythrocytes	0.18

* Findings of Dr. van Ormondt.

TABLE 14.—*Copper Content of the Blood of a Mother and Child* *

	Copper, Mg. per Liter	
Observation	Mother	New-Born Infant
1	2.10	1.37
2	1.40	0.97
3	1.67	0.70
4	2.22	0.86
5	1.80	1.20
6	2.13	0.90
7	2.20	1.23

* Findings of Dr. Weyers.

lected white cells of normal horse's blood, that leukocytes do not contain more copper than erythrocytes. Moreover, this fact was clearly demonstrated in a case of leukemia in which no fewer than 7,600,000 leukocytes per cubic centimeter were found. In this case the leukocytes did not contain more copper than the red cells; however, the cells were all pathologic and did not contain granulations.

Much remains to be questioned, but nevertheless we feel that the discovery that copper as a catalyst in the formation of hemoglobin has some importance in clinical observations.

As for the influence of other diseases than anemia on the copper content of the blood, we have so far studied only the influence of pregnancy and of infectious diseases. In both conditions, in agreement with Krebs, we found a high percentage of copper in the blood. A comparison between the copper content of the blood of new-born infants and that of their mothers revealed a pronounced difference, the value for the mothers' blood being higher. A higher copper content of the blood was also found in infectious diseases. It is not difficult to see that both conditions—pregnancy and infectious diseases—necessitate a greater production of hemoglobin, and, as a consequence, there is a mobilization of copper.

DISCUSSION

DR. JULIUS H. HESS: Which form of iron do you use for practical clinical purposes?

PROF. DR. E. GORTER: I use the pulverized iron preparation, for it contains more copper than the others. I decrease the amount of milk and add some foods that contain more iron.

DR. C. G. GRULEE: The presentation was perfectly clear to me, and I believe, as I have felt clinically all along, that the copper content of the food is not a major element in the production or in the maintenance of anemia.

I wish to thank Professor Gorter and to compliment him on the thoroughness with which the work was carried out.

DR. FREDERIC W. SCHLUTZ: Professor Gorter brought out a point which I think is important. It is the loss of iron in the stool. Recently I had an opportunity to study a very severe case of anemia in an infant 23 months old who had a hemoglobin of 27 per cent. I had been interested in vegetable feeding and in determining the iron retention of such food, in an attempt to prove the theory expressed by Czerny some years ago that the iron retention was large in that type of feeding. Czerny insists that the milk content of the diet must be simultaneously lowered. Clinically, I have had the experience that if the milk in the diet of a child is reduced and it is given fruit and vegetables with a high iron content, anemia can apparently be cured very readily. To my surprise, I found that the feeding of a vegetable in the form of spinach gave a low retention of iron. The work of Whipple proved that in the experimental animal the feeding of apricots gives some retention of iron. We found the same thing in the infant with anemia. This infant received iron and copper in addition to the other substances. He then showed some increase in the retention of iron and also an increase in the hemoglobin concentration, but not nearly as marked as he did when liver was added. In this case the passing of large stools invariably meant diminished retention of iron. I believe that Czerny is correct when he insists on the reduction in the amount of milk and states that benefit will be derived from the feeding of vegetables and fruit only when the amount of milk is reduced.

DR. M. L. BLATT: I should like to ask what method was used for the determination of the hemoglobin. I should like to add the fact that we have found that premature infants with a relatively low hydrogen ion concentration in the stool show gram-positive flora and thrive more satisfactorily than do those in whom the hydrogen ion concentration is higher and the flora gram-negative. Does Professor Gorter think that this reaction in the stool has any relationship to the ammonia content of which he spoke?

PROF. DR. E. GORTER: I think that what Dr. Schlutz said is very important, for I think that the retention of iron should be carefully examined. I wonder whether Dr. Schlutz has made the observation that the acidity of the stool is important. I have always found that an acid stool is more likely to give a positive iron balance than is an alkaline stool.

DR. F. W. SCHLUTZ: I think that the alkalinity of the stool is a very important factor.

Progress in Pediatrics

ACRODYNIA

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Although acrodynia is an unusual condition in most parts of this country, it is so unique as to deserve attention. So far as I know, it is the only condition in childhood in which disordered function of the vegetative nervous system underlies a characteristic and complex clinical picture. The etiology is still undetermined, and the pathologic reports have often been contradictory. Diagnosis should be easily made by any physician familiar with the manifestations, even if he has never observed a previous case. In one of the four cases which will be briefly reported in this review the correct diagnosis was made by the first doctor to consider the possibility, though he had not seen a patient with acrodynia prior to this. Three doctors who had previously attended the patient and a consultant had given such diagnoses as mental deficiency, cretinism, allergic disease and an "unknown condition." Naturally, in a chronic condition of this sort, correct diagnosis is of great importance in preventing unnecessary worry and concern by parents.

About two hundred and fifty cases or more of acrodynia have been reported since 1914, when the first series was described by Dr. Swift of Adelaide, Australia, at the Australasian Medical Conference.

TERMINOLOGY

A variety of terms have been applied to the syndrome. "Erythredema" has been used at times. In 1925, Butler,[1] a dermatologist, stated that edema of the corium was found at biopsy in skin from the hand of a patient with acrodynia. Warthin,[2a] however, saw no such edema in two patients at necropsy, and stated that it was not present in Butler's photomicrograph. In Great Britain "erythredema polyneuritis" has often been the preferred term. Whether true polyneuritis is ever present, however, is open to debate, and the inclusion of "erythredema" makes this nomenclature additionally unsatisfactory in the light of present information. "Swift's disease" is used uncommonly in medical periodi-

1. Butler, J.: Erythredema: Pink Disease, Arch. Dermat. & Syph. **11**:166 (Feb.) 1925.

2. Warthin, A. S.: (*a*) So-Called Acrodynia or Erythredema (Swift's Disease), Arch. Path. **1**:64 (Jan.) 1926; (*b*) Swift's Disease, Proc. A. Research Nerv. & Ment. Dis., 1930, p. 9.

cals. In Germany, in honor of Professor Feer of Zurich, who first, independently, described the condition in the locality, clinicians have favored the term "Feer's vegetative neurosis." In this country, "neurosis" can scarcely be accepted in this sense, namely, as a disturbed physiologic function. "Pink disease" has had a wide use among the clinicians of Australia. Although this term is somewhat slangy and is only vaguely descriptive, it is used occasionally in Australian, English and American reports. Had it been more widely used in the literature, it would be sufficiently satisfactory at the present time. "Acrodynia" has been most widely employed in French and American articles. In 1827 and 1829 the same name was applied in France to widespread epidemics of arsenic poisoning from contaminated wine. Only a rather extreme academic purism can stand against the common custom of calling the children's disease of the present time by the same term.

INCIDENCE

The vast majority of cases appear in infants and young children between 8 months and 4 years of age. A few cases have been seen in younger persons. Péhu and Ardisson [3] saw acrodynia in an infant aged 6 weeks. The same authors mentioned a case in the oldest patient for whom the diagnosis could be accepted—a child of 14 years. Males predominate slightly. There is no known racial predisposition. Warthin,[2b] pointed out that in America the majority of cases appear in the winter or spring, whereas in Australia they begin in late summer and fall—the "catarrhal seasons" in these respective countries.

ETIOLOGY

At the present time there are probably only two theories regarding the causation of acrodynia which are supported by a reasonable amount of evidence. The one presupposes a specific infection of unknown etiology, and is favored principally by the continental observers, including Feer [4a] and Jenny.[5] Feer's first case and the three cases reported by Jenny were in patients from the same small circumscribed region in Switzerland. Feer [4b] stated that many parts of Germany, especially the east portions, have remained free of the malady; whereas in other parts there exist distinct islands within narrow boundaries from which

3. Péhu, M., and Ardisson, P.: Bull. Soc. de pédiat. de Paris **25**:456 (Oct.-Nov.) 1927.

4. Feer, E.: (*a*) Eine eigenartige Neurose des vegetativen Systems beim Kleinkinde, Jahrb. f. Kinderh. **108**:267 (May) 1925; (*b*) quoted in Pfaundler, M., and Schlossmann, A.: Handbuch der Kinderheilkunde, ed. 4, Leipzig, F. C. W. Vogel, 1931, vol. 3, p. 528.

5. Jenny, E.: Die Swift-Feersche Krankheit, Schweiz. med. Wchnschr. **55**: 645 (July 9) 1925.

in the course of years many new cases appear, as in Solingen, Heidelberg, Basel and East Switzerland. In Zurich, from April, 1925, to January, 1926, there were seven cases of acrodynia, other years being free. During April, 1930, there were five new cases. Cases in the same family have been reported, once by Feer and once by Byfield. In addition, the patients usually have leukocytosis, and this occurs in the absence of demonstrable foci of infection.

The other most tenable theory of the possible cause of Swift's disease holds that this condition is the manifestation of the toxic effects of a previous case of influenza or repeated infections of the upper respiratory tract in certain persons. Byfield,[6] from an analysis of seventeen of his own cases, noted an unusually high incidence of preceding respiratory infections. Nevertheless, in a "small number" of cases the most careful questioning failed to reveal anything resembling acute respiratory infection. In Canada, Brown, Courtney and MacLachlan,[7] studied nine patients with the syndrome and concluded that it was perhaps a chronic intoxication following or coincident with chronic respiratory infection. It occurs in "catarrhal seasons." In a percentage of cases high enough to suggest a connection—though not in all cases—attention to focal inflammation of the tonsils, adenoids or sinuses seems to have produced favorable results.

This illness has been conclusively shown to be unrelated to tuberculosis, syphilis and arsenic poisoning.[7a]

Warthin [2b] and Weston [8] maintained that pink disease was due to vitamin B deficiency. The former based his belief on the similarity of the pathologic changes in the skin in this disease to those in the early stage of pellagra. The latter was impressed by the clinical resemblance of the dermatitis of the hands in both conditions. Nevertheless, most

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6. Byfield, A. H.: A Polyneuritic Syndrome Resembling Pellagra-Acrodynia (?) Seen in Very Young Children, Am. J. Dis. Child. **20**:347 (Nov.) 1920.

7. Brown, A.; Courtney, A. M., and MacLachlan, I. F.: A Clinical and Metabolic Study of Acrodynia, Arch. Pediat. **38**:609 (Oct.) 1921.

7a. Since the submission of this manuscript, Meyer and Weise have described a case of acrodynia in the Journal of Pediatrics (**2**:750 [June] 1933) in which 0.106 mg. of arsenic per hundred grams of solid and 0.029 mg. of lead per thousand cubic centimeters were found in the urine. They believed that the absorption of arsenic followed contact with an insecticide. A child with acrodynia who was recently seen by the author at the New York Hospital excreted approximately 0.045 mg. of arsenic in one thousand cubic centimeters of urine on two analyses about one week apart. In this case, no contact with insecticides, green wall paper or upholstery, green artificial flowers or arsenical mouth washes was suggested. The patient frequently ate apples but these were "always washed." In view of the findings in these two cases, further investigation should be made for any possible arsenical factor. The urine of two of Byfield's patients gave negative tests for arsenic.

8. Weston, W.: Arch. Pediat. **37**:513 (Sept.) 1920.

patients give no history of dietary deficiency or of any factors which might prevent satisfactory assimilation, and other investigators have not obtained improvement with feeding vitamin B.

Helmick,[9] on the basis of experience with nine cases, thought that the illness suggested an allergic condition. He emphasized the sudden changes between misery and a fair degree of comfort, the variations in the size and severity of the lesions of the skin, the mild local findings in the throat as contrasted with the severe constitutional symptoms, the similarity of the ocular signs to those in hay fever, the tendency toward a normal temperature and the chronicity of the disease. However, there are several features which probably eliminate Helmick's hypothesis. The disturbances of the autonomic nervous system in acrodynia are without analogy in atopic diseases, as are also the changes in the central nervous system. Acrodynia is a self-limited condition. None of the common forms of allergy are discoverable in the patient or in the family history. Eosinophils do not appear in the blood.

Vipond [10] stated that he had seen many cases, and that he isolated a gram-negative diplococcus by puncturing the enlarged lymph glands in all the patients. He claimed practical cure after five or six inoculations with a vaccine made from this organism, which was given at intervals of from three to six days. His work has not been repeated, but his reports of the relationship of the diplococcus to the disease and the effect of the vaccine on its course have been skeptically received.

PATHOLOGY

Only a few cases have come to autopsy. Much disagreement has obtained, especially in regard to the changes in the central and peripheral nervous systems. The majority of the examinations were made by general pathologists lacking experience in the complicated science of neuropathology. Dr. Samuel Orton [11] believes that many changes in the nervous system which are described in the literature on acrodynia are normal or agonal. At the other extreme, significant variations have perhaps been overlooked.

Brain.—No microscopic abnormalities were seen in two cases of Warthin's,[2b] in two of Paterson and Greenfield's, [12] in one of Helmholz' [13]

9. Helmick, A. G.: Symptomatology of Acrodynia as a Basis for a New Line of Investigation as to Its Etiology, Arch. Pediat. **44**:405 (July) 1927.

10. Vipond, A. E.: Acrodynia and Its Probable Causation, Arch. Pediat. **39**: 699 (Nov.) 1922; Further Observations upon Acrodynia, Brit. J. Child. Dis. **23**: 127 (April-June) 1926.

11. Orton, S.: Personal communication to the author.

12. Paterson, D., and Greenfield, J. G.: Erythroedema Polyneuritis, Quart. J. Med. **17**:6 (Oct.) 1923.

13. In discussion of Rodda, F. C.: Acrodynia, Am. J. Dis. Child. **30**:596 (Oct.) 1925.

and in one of Howland's.[13] In both his cases Warthin described marked edema of the brain, cord and meninges, as well as a dilated central canal of the cord, but these changes have not been seen in other postmortem examinations.

On the other hand, Blackfan's [13] case showed "histologic evidences like that reported in encephalitis." From the Mayo Clinic there is the report of Kernohan and Kennedy [14] on one case of acrodynia in which changes in the brain, especially in the region of the fourth ventricle and the thalamus, were described. These changes, which Wyllie and Stern [15] considered normal, will not be detailed here. Francioni and Vigi [16] of Bologna examined the brain of a girl, aged 4½ years, who died of acrodynia. Many cells in the region of the infundibulum and tuber cinereum presented central achromasia and condensation of chromatin at the periphery of their protoplasm, eccentric nuclei and an occasional shadow cell. Francioni and Vigi concluded that acrodynia is a disease which strikes with predilection the mesocephalic region of the infundibulum and tuber cinereum (the mesocephalic sympathetic centers); they found a pathologic process definitely localized there, which was gradually dissipated as sections farther toward the hypothalamus were examined. Wyllie and Stern saw abnormality in the central nervous system above the medulla in only two of their seven cases post mortem. In one of these a slight cellular infiltration was present in sections of the cerebral cortex, brain stem and medulla; in the other a similar infiltration was noted in the cerebral cortex and basal ganglions. Careful sectioning of the cortex, midbrain, pons and medulla showed no chromatolysis of nerve cells.

Spinal Cord.—At necropsy two of Warthin's cases, one of Howland's, one of Feer's and one of Jenny's were reported to show normal spinal cords.

Paterson and Greenfield,[12] in one of their two postmortem examinations, found a slight increase in glia. In the other, they noticed a diffuse increase of small cells in the gray matter, especially in the ventral horns, where some of the large motor cells were swollen and contained eccentric nuclei and pale Nissl granules, displaced toward the periphery. Changes were most marked in the lumbosacral region, where there was also more intense vascular congestion. Recently, Wyllie and Stern [15] confirmed the observations of Paterson and Greenfield in seven necropsies of their own. In all seven the spinal cord showed diffuse

14. Kernohan, J. W., and Kennedy, R. L. J.: Acrodynia (So-Called), Am. J. Dis. Child. **36**:341 (Aug.) 1928.

15. Wyllie, W. G., and Stern, R. O.: Pink Disease, Arch. Dis. Childhood **6**: 137 (June) 1931.

16. Francioni and Vigi, quoted by Péhu, M., and Mestrallet, A.: Hypothèses sur la nature de l'acrodynie, Rev. de méd., Paris **48**:1 (Jan.) 1931.

infiltration with small cells, although this was slight in two instances. These cells resembled glia cells rather than lymphocytes in their staining reactions, though processes could not be demonstrated by the staining methods used for neuroglia or microglia.

Pathologic observations which satisfactorily explain the clinical picture of disturbed function of the vegetative system were enumerated by Orton and Bender [17] from a detailed study of Byfield's case 13. In the lateral horns of the cord, at several levels, they found lesions of long standing. There was marked destruction of cells, and many of the remaining cells had undergone degeneration by chromatolysis, fragmentation and sclerosis. The contrast between the anterior and lateral horns was striking, the Weigert-Pal stain showing a marked loss of myelin in the lateral horns as compared with the anterior and posterior horns. In the anterior horns were large, well formed nerve cells showing acute chromatolysis but retaining their form; they had no obvious glial reaction. Only a few nerve cells were left in the lateral horns; these were very small and shrunken, and many showed various stages of fragmentation. In the area of destruction there was well developed cellular gliosis with many fiber-producing glia cells. These areas also showed numerous small hemorrhages, which were found frequently in other areas of the cord as well, though somewhat less frequently. There was moderate pial proliferation with some lymphocytic infiltration. Except for their restriction to the lateral horns, the lesions bore a striking resemblance to those seen during the healing stage of anterior poliomyelitis. This resemblance was most marked in the levels where the lateral horn is best developed; and it is inferred that the lateral horns were rather selectively destroyed by some noxious agent in much the same way as the anterior horns are affected in poliomyelitis.

Orton and Bender pointed out that in the lateral horns of the gray matter of the spinal cord lie cell bodies of neurons which form the motor link between the spinal cord and the sympathetic ganglions. The myelinated axis-cylinders of the cells of the lateral horns pass out from the cord in motor roots in company with those of the cells of the anterior horns, but soon form separate bundles—the white rami of the sympathetic nervous system—which pass to various sympathetic ganglions. So far as is known, these fibers form the only pathway by which the sympathetic chain can be brought under the influence of the spinal cord and the higher centers, and the neurons of the lateral horns are to be looked on as a splanchnic effector mechanism.

Orton and Bender's conclusions explain the syndrome of the disease very satisfactorily. Whether the increase of glia in the cord

17. Orton, S. T., and Bender, L.: Lesions in the Lateral Horns of the Spinal Cord in Acrodynia, Pellagra and Pernicious Anemia, Bull. Neurol. Inst., New York **1**:506 (Nov.) 1931.

found by Paterson and Greenfield and by Wyllie and Stern is of specific significance or is merely associated with systemic intoxication is difficult to establish. Orton and Bender stated that there is considerable normal variation in children. They believed, however, that the changes described by Francioni and Vigi in the mesocephalic sympathetic centers are probably sufficiently pronounced to be of significance.

Peripheral Nerves.—Kernohan and Kennedy [14] and Paterson and Greenfield [12] saw considerable myelin destruction in the peripheral nerves. The latter authors believed that their observations proved conclusively that the disease was a polyneuritis affecting particularly the peripheral parts of the nerve trunks. In four of the seven cases reported by Wyllie and Stern degenerative lesions were found in the peripheral nerves. In one case of very long standing, myelin degeneration had reached such an advanced stage that the Weigert-Pal method of staining was applicable. Helmholz [13] alluded to "definite changes in the nerves" in one case which came to autopsy. On the other hand, Howland's case offered a "very disappointing study of the nerves—there were a few changes but not sufficient to warrant the diagnosis of peripheral neuritis." Orton [11] believes there have been insufficient criteria for a diagnosis of polyneuritis in the reported cases.

Sympathetic Nerves.—As a rule, the sympathetic nerves were unaffected in the few cases in which they were examined. On the other hand, Wyllie and Stern reported "vagus degeneration" as the chief observation at autopsy in one case of sudden death.

It is apparent that there is urgent need for further postmortem study by expert neuropathologists of the changes in the central nervous system in acrodynia.

Muscles.—Simple atrophy is sometimes found.

Skin.—Warthin's two patients showed edema, hyperkeratosis and reticulo-endothelial proliferation in the papillary layer and corium. Warthin was struck by the similarity of the changes in the skin to those seen in the early erythematous stages of pellagra, in erythema caused by roentgen and ultraviolet rays, and in certain forms of sensitization to light, as xeroderma.

Endocrine Glands.—All the endocrine glands were studied and were usually found to be normal. Hypoplasia of the suprarenal medulla may occur.[18]

Lymphatic System.—Warthin's two patients exhibited hyperplasia of all the lymph nodes and marked exhaustion of their germinal centers. There was hyperplasia of the lymphoid apparatus in Jenny's patient. Paterson and Greenfield noted enlargement of the mesenteric glands

18. Warthin.[2b] Jenny.[5]

in one of their cases which came to autopsy, but these glands were histologically normal.

Cardiorespiratory System.—"Extensive sinus involvement" occurred in Helmholz' patient. In thirteen reports on the condition of the lungs there were eight cases of bronchopneumonia, one of miliary tuberculosis, one of advanced pulmonary tuberculosis and one of pulmonary abscess; in two cases the findings were normal. Hypoplasia of the heart and aorta has been described.[2b]

Digestive System.—Catarrhal enterocolitis was present in both Warthin's patients. Kernohan and Kennedy found in the intestinal tract merely a slight prominence of Peyer's patches of the ileum and of the solitary lymph follicles of the colon. In one of Paterson and Greenfield's cases there were two small ulcers in the lower part of the ileum. This patient died of miliary tuberculosis. In their other patient there was ileocecal intussusception.

Other Pathologic Observations.—Additional postmortem observations have been: "extensive lymphoid infiltrations in various organs" (Blackfan); marked necrosis of the mandible, sclerosis of the cranial bones and cloudy swelling of the heart, liver and kidneys (Oliver [19]); passive congestion, atrophy and slight parenchymatous degeneration of all the organs (Warthin); chronic splenic enlargement, cloudy swelling of the kidneys, ascariasis, diffuse colloid struma and cardiac hypertrophy (Jenny), and trophic ulcers of the tongue, cheeks, fingers and regions of the knee (Feer, Wyllie).

SYMPTOMATOLOGY

The onset may be abrupt or gradual, lasting for two weeks or more. At first there is increasing irritability and insomnia, sometimes with a low grade fever. Photophobia, conjunctivitis, lacrimation, profuse sweating and a generalized miliary rash often appear early, though occasionally ocular signs are lacking throughout the course of the disease. Asthenia and hypotonia become increasingly marked. The typical appearance of the hands and feet is usually established by the second or third week. This is a swollen, cold, beefy, slightly cyanotic erythema, which is most marked at the tips of the fingers and toes and shades out gradually. It is accompanied by painful local paresthesias.

Sometimes unexplained fever appears a few weeks before the onset. This lasts for two or three days and is followed by an uneventful interval prior to the beginning of the symptoms.

During the height of the illness, the patient may bury his face in the pillow or the mattress and lie in one position for long periods.

19. Oliver, E. A.: Erythredema; Pink Disease, Arch. Dermat. & Syph. **11**:166 (Feb.) 1925.

Sometimes he lies with the head between the knees. All interest in play is lost. Hypotonia is marked. Weakness may be so great that he is unable to stand. The mind, however, is normally oriented.

Loss of appetite is common. Occasionally there may be diarrhea, but more often constipation or normal bowel function is seen. Gastric analyses in two cases gave results which were within normal limits (Byfield).

Besides the typical appearance of the hands and feet, there may be a similar erythema of the tip of the nose, the malar prominences of the cheeks or the tips of the ears. This erythema waxes and wanes, and branny or rather coarse desquamation appears with its intermittent fading. The changes in the intensity of the erythema are most marked when the disease begins to subside. The profuse, irritating sweat which bathes the skin also shows more and more pronounced remissions as the illness improves. Macules, papules, bullae [20] and pustules are sometimes found alone or in combination, scattered over the general surface of the skin. Furuncles are not unusual. Craig [21] reported subcutaneous abscesses complicating a case in a patient who recovered. Trophic ulcers of the hands and feet complicate the disease now and then; some have even developed into gangrene. Sometimes the finger-nails and toe-nails are shed.

Frequently there is a liberal falling out of hair. Quite commonly the patient pulls out handfuls of hair (trichotillomania).

Keratitis has been described (Byfield), as have small ocular hemorrhages.[22] The eyegrounds were examined in two of the cases of the present series and were found to be normal.

There is constant and striking tachycardia, the pulse rate ranging usually from 120 to 160 in a resting febrile child. Another feature of acrodynia is the hypertension, usually between 100 and 130 mm. of mercury.

Excessive salivation is the rule. Now and then mild gingivitis appears, though in its absence normal teeth may loosen and fall out. Ulceration of the tongue and cheeks has occurred. Van der Bogert [23] reported the case of an infant aged 21 months in whom gangrene of the mouth developed, with the coming away of a considerable portion of the alveolar process as a sequestrum.

Ordinarily there is no splenic enlargement in the absence of complications. Lymph nodes, especially in the cervical groups, often show mild or moderate enlargement.

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20. Bratusch-Marrain, A.: Arch. f. Kinderh. **78**:206 (June) 1926; abstr., München. med. Wchnschr. **73**:1114 (July 2) 1926.

21. Craig, R. A.: Arch. Pediat. **44**:581 (Sept.) 1927.

22. Debré, R., and de Cosini, S.: Monde méd., Paris **40**:33 (Jan.) 1930.

23. Van der Bogert, F.: Acrodynia, Arch. Pediat. **40**:410 (June) 1923.

There are no signs of meningeal irritation. Convulsions are unusual. Sometimes there is partial or total loss of sensibility to pain (pin-prick). Deep reflexes are usually diminished or absent, but may be normal or exaggerated. Tremor is unusual. Flaccid paralysis of the lower extremities has been observed.[24] The electrical excitability of the nerves and muscles is said to be undiminished. Müller [25] reported a case with increased electrical reactions and a Chvostek sign, but the majority of patients give no evidence of tetany.

Sinusitis is a fairly common complication of acrodynia. Bronchitis and bronchopneumonia occur occasionally; the latter has a high incidence among fatal complications. Pyuria is sometimes found, but does not appear to affect the prognosis unfavorably. Lapage [26] mentioned a curious golden orange-tinted urine as characteristic of acrodynia.

It is of interest that intussusception has been a complication in three cases.[27]

LABORATORY FINDINGS

Blood.—The blood sometimes shows secondary anemia. Polymorphonuclear leukocytosis is fairly constantly found, with a total white blood count of from 10,000 to 20,000. The Kahn and Wassermann reactions are negative. Blood cultures are sterile. Sugar tolerance tests have not given uniform results. In my first case tolerance was somewhat decreased in two determinations. In the first test, the blood sugar during fasting was 95 mg. per hundred cubic centimenters, with one and two hour values of 196 mg. and 200 mg. In the second test, the level during fasting was 97 mg., with values of 140, 183 and 139 mg. at intervals of one, two and three hours. In my second case, tolerance was again somewhat decreased. The sugar during fasting was 100 mg., with a rise to 176 and 178 mg. at intervals of one and two hours. In my third case, on the other hand, tolerance was increased. The sugar during fasting was 108 mg., and values of only 100 and 113 mg. were found at periods of one and two hours. (These tests were performed with the routine of MacLean and Sullivan [28]). Two of Feer's

24. (*a*) Schwartz, A. B.: Dermatopolyneuritis with Motor Paralysis of the Lower Extremities, Am. J. Dis. Child. **39**:359 (Feb.) 1930. (*b*) Péhu and Ardisson.[3]

25. Müller, M.: Feersche Krankheit, München. med. Wchnschr. **72**:2224 (Dec. 25) 1925.

26. Lapage, C. P.: Erythroedema or Pink Disease, Lancet **1**:176 (Jan. 23) 1926.

27. Thursfield, J. H., and Paterson, D. H.: Dermato-Polyneuritis (Acrodynia: Erythroedema), Brit. J. Child. Dis. **19**:27 (Jan.-March) 1922. Paterson and Greenfield.[12] Lapage.[26]

28. MacLean, A. B., and Sullivan, R. C.: Dextrose Tolerance in Infants and in Young Children, Am. J. Dis. Child. **37**:1146 (June) 1929.

patients had normal tolerance. Blood chemistry determinations were carried out in my first three cases, and normal values for chlorides, calcium and phosphorus were obtained. The nonprotein nitrogen was also normal, except in case 1, in which two determinations gave an unexplained increase to 58 and 40 mg. per hundred cubic centimeters. In case 2, the blood cholesterol and serum albumin, globulin and fibrinogen were normal. According to Feer,[4b] calcium is often increased to from 11 to 12 mg. and phosphorus is apt to be low (3.5 mg.).

Spinal Fluid.—The literature on acrodynia attests that the spinal fluid findings are uniformly negative, with the exception of those in three cases mentioned by Blackfan. Two of these patients showed an "increase in globulin," and one had an "increase in cells." In two of my cases the ammonium sulphate test for globulin was negative and there was no increase in cells. A quantitative test was done in one case, and a spinal fluid protein of 85 mg. per hundred cubic centimeters was found. (If quantitative tests for spinal fluid protein were performed as a routine, slight increases might be noted more frequently.) In the two patients of the present series who had lumbar punctures no elevation of the spinal fluid sugar in relation to the blood sugar was found. Chlorides were normal, and the Kahn test gave negative results.

Bacteriology.—Examination of the nose and throat has shown an inconstant and varied group of the organisms often found in routine cultures of the throat. Vipond alone claimed that he had discovered a relationship between the disease and a definite bacterial agent.

Brown, Courtney and MacLachlan [7] studied two cases of acrodynia from a metabolic standpoint. They found a lowered or negative nitrogen balance and, in one case, a negative balance for bases.

Electrocardiography.—Electrocardiograms of only a few patients have been studied. Ihm [29] reported one case with tachycardia. He found noteworthy a long P R interval and slow ascent of the T wave, which was almost negative in lead II. On the other hand, Glauber's [30] patient, a girl, 3 months old, had a very high T wave in lead II. In case 3 of this series there were no positive findings except tachycardia.

Roentgen Studies.—Gilbert,[31] in reporting three cases of acrodynia, stated that roentgen rays revealed no evidence of rickets. Debré and de Cosini [22] stated that roentgen studies had not, as yet, given any interesting results. Roentgenograms of the hands of Weber's [32] patient,

29. Ihm, L.: Klin. Wchnschr. **4**:2351 (Dec. 3) 1925.

30. Glauber, R.: Monatschr. f. Kinderh. **43**:429, 1929.

31. Gilbert, A.: J. Arkansas M. Soc. **26**:239 (May) 1930.

32. Weber, F. P.: Case of Erythroedema and the Question of Acrodynia, Brit. J. Child. Dis. **19**:17 (Jan.-March) 1922.

the tips of some of whose fingers were lost by gangrene and ulceration, disclosed "small areas of imperfect calcification or of decalcification."

In cases 3 and 4 of my series, roentgenograms of the long bones were studied. They presented changes similar in certain respects to those enumerated by McLean and McIntosh [33] as characteristic of infantile scurvy. There was a marked increase in the density of the primary zones of calicification, which was best shown in the lower radii and in the distal ends of all the metacarpal bones (fig. 1). The perimeters of the centers of ossification throughout the long bones were exaggerated (figs. 1 and 2). In case 3 follow-up roentgenograms were made six months after recovery. The centers of ossification, however, did not present the nuclear arrangement which is considered pathognomonic of infantile scurvy in the healed stage. The only changes in the follow-up films were the symmetrical transverse lines through the long bones corresponding closely to the old provisional zones of calcification (fig. 3).

I do not believe that the changes shown by the roentgenograms are specific in any way. They probably represent variations that appear in children after any rather severe malady of long duration.

REPORT OF CASES [34]

CASE 1.—P. P., an Austrian male infant, aged 10 months, was admitted to the hospital because of anorexia, constipation, constant crying and a rash on the face and back of three weeks' duration. The family history and the past history were not significant. There had been no preceding colds or otitis, but there had been coryza and fever at the onset. Redness of the eyes was noted, and persisted.

Physical examination showed congested conjunctivae, with some photophobia. There were some hoarseness and moderate congestion of the throat. The face and body were covered with a miliary eruption. The hands were "beefy" and showed some desquamation. Both ear drums bulged and seropurulent material drained from them after incision. There was mild cervical adenopathy. The spleen was not palpable. The blood pressure was 110 systolic and 80 diastolic and the heart rate 140.

The patient remained in the hospital for two weeks. No special therapy was given. He ate well. During his stay the fingers and toes were usually cold, bluish red and swollen. He often lay for long intervals with his face buried in the pillow. He perspired profusely. His temperature was irregular, varying from normal to 101 and 102 F.

Shortly after the patient's discharge the family moved and could not be located. The janitress of the former apartment stated that the infant had died a few days after leaving the hospital. She knew no particulars.

CASE 2.—G. B., an American girl, aged 21 months, was admitted to the hospital for peeling and itching of the hands and feet, which had lasted two months. There had been a slight degree of photophobia but very little sweating. There was also

33. McLean, S., and McIntosh, R.: Healing in Infantile Scurvy as Shown by X-Ray, Am. J. Dis. Child. **36**:875 (Nov.) 1928.

34. The reported cases were seen at the Babies' Hospital in the service of Dr. Herbert Wilcox.

the complaint of anorexia, irregularly alternating hard and loose stools, thirst and excessive urination. The infant had not been feverish but had seemed very fretful. At 19 months she had pneumonia and at 20 months "otitis."

Physical examination revealed a child lying on her face and not acutely ill. The conjunctivae were slightly injected, and the eyes seemed sensitive to light.

Fig. 1.—Roentgenogram of the hand and the long bones of the arm of the patient in case 3. Note the increase in density of the peripheral zones of calcification, which are best shown in the lower radii and the distant ends of metacarpals. Note also the exaggeration of the perimeters of the centers of ossification.

The throat was normal. The blood pressure was 118 systolic and 90 diastolic, and the heart rate 180. The inguinal and axillary glands seemed firm and somewhat enlarged. On the chest could be seen a brownish, miliary eruption. The hands were cold, swollen and pink, with a brownish-red macular eruption on the dorsal

aspect. Considerable flaky desquamation was found on the fingers. There was slight desquamation on the toes. The plantar surfaces of the feet were beefy red.

The patient remained under observation for seven days. The temperature was usually about 99 F., with an occasional rise to 100 or 100.5. Nearly all solid food was refused, but fluids were freely taken.

Fig. 2.—Roentgenogram of the lower extremities of the patient in case 3. Note the changes in the peripheral zones of calcification and the exaggerated periphery of the epiphyses.

After discharge complete recovery ensued. The child was examined about a year later. Unfortunately, no record was made of the history during the interval.

CASE 3.—C. M. A., an American girl, aged 30 months, suffered from photophobia, itching and swelling of the eyelids, swelling and redness of the hands, with constant pain, irritability, marked insomnia and profuse diaphoresis for two

months. She often lay with her face buried in the pillows. For the six preceding weeks, she had refused to walk and had lost 8½ pounds (3.9 Kg.) during this time. She had not been feverish and had had a good appetite. Her stools had been quite hard at times. From time to time there had been an eruption on the body. In general, she had been miserable.

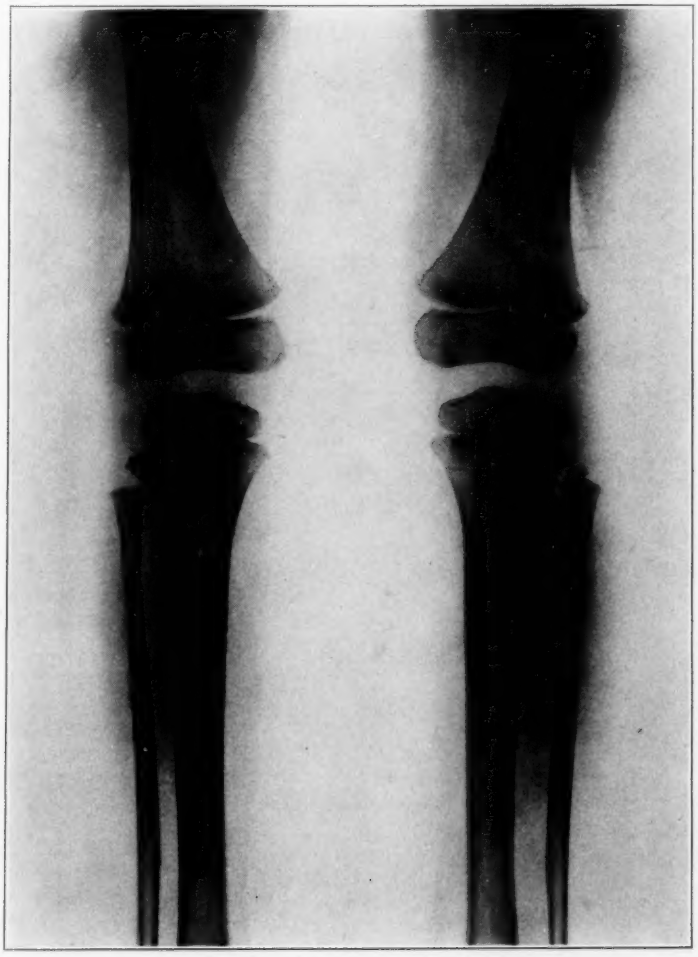

Fig. 3.—Follow-up roentgenogram of the lower extremities of the patient in case 3 six months after recovery. The only changes seen are symmetrical tranverse lines through the long bones, corresponding closely to the old provisional zones of calcification. The centers of ossification are normal.

The child had developed normally and had had a well rounded diet with satisfactory amounts of orange juice and cod liver oil. Except for frequent attacks of tonsillitis, she had been well and active.

Physical examination revealed a well developed and well nourished child lying prone and shielding her face with her arms. Her hair was fair and her skin delicate. The upper lids were slightly puffy with marked blepharospasm and moderate lacrimation on the right. There was moderate injection of the left conjunctiva. The tonsils were small and buried. A small left subangular gland and

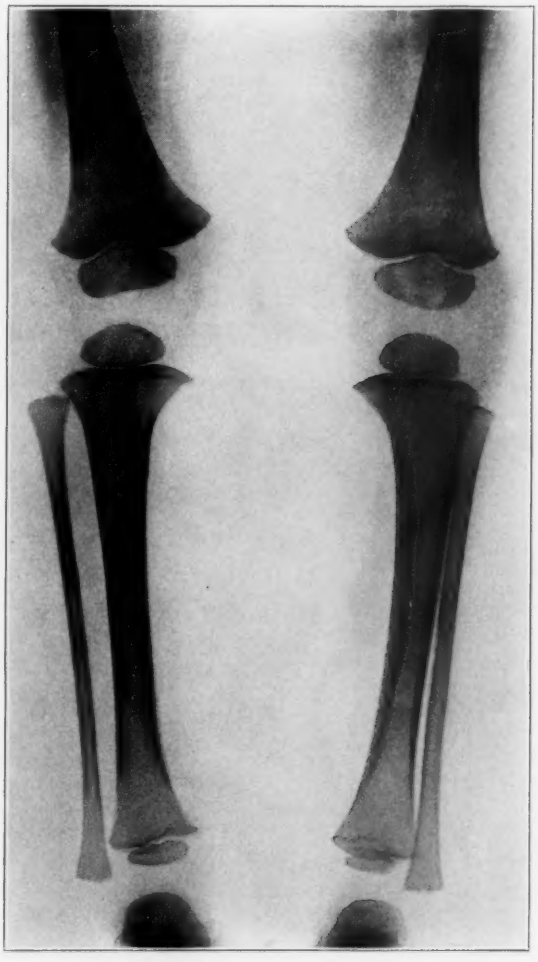

Fig. 4.—Roentgenogram of the lower extremities of the patient in case 4, showing the typical changes found in the patient in case 3.

moderately enlarged axillary and inguinal glands were palpable. The heart rate was 150 when the patient was quiet and recumbent, and the blood pressure was 138 systolic and 96 diastolic. The spleen could not be felt. The hands were cold, and the dorsal surfaces were swollen but did not pit on pressure. The fingers were pink, especially distally, with a cyanotic tinge about the nails. The toes were cold and deep pink. At the base of the fingers and on the palms a fine, pink macular

rash could be seen. The general surface of the skin was damp and warm, and the clothes were wet with perspiration. The biceps reflexes were equal and active. The triceps response was doubtful. The abdominal reflexes were active. Knee jerks and ankle jerks could not be obtained. There were no meningeal signs. The sense of touch was preserved, but there was definite generalized loss of the sensation of pain to pin-prick. In addition, there was moderate generalized hypotonia.

Fig. 5.—Characteristic burying of the head and maintenance of the knee-chest position in acrodynia (case 3).

Fig. 6.—Photophobia in acrodynia. Note the expression of discomfort in the facies (case 3).

The patient remained fifteen days in the hospital. She was given 2 teaspoonfuls of dried brewer's yeast (Harris) three times daily and five treatments with the mercury vapor arc lamp. On the eighth day tonsillectomy and adenoidectomy were performed. The patient's condition did not improve noticeably. The photophobia, diaphoresis and pinkness of the hands and feet varied from time to time. The heart rate constantly ranged between 140 and 150 beats a minute, and four blood

pressure readings varied from 138 systolic and 98 diastolic to 148 systolic and 92 diastolic.

Following discharge, the yeast treatment was prolonged for several weeks. The child made irregular progress and did not attain complete recovery until five months later.

Case 4.—R. M., a boy, aged 20 months, of Irish parentage, had had redness of the hands and feet for six weeks. Ten weeks before entry, he had a high fever for two or three days; the family physician said that he was teething. He was well for four weeks; then irritability, redness and blistering of the hands and feet, sweating and a rash on the body were noticed. He was observed to bury his face in his pillow at times. He had not suffered from insomnia, and he had a good appetite and normal bowel function.

Physical examination revealed a chronically ill and undernourished appearance. Photophobia was questionable. The pharynx was acutely inflamed, and the tonsils seemed very large. In all areas there was moderate shotty glandular enlargement. A papular rash could be seen over the entire body, with a scattering of pustules over the abdomen. There was a suppurating abscess proximal to the left knee. The hands and feet were cold, and the distal parts of the fingers and toes were bluish-red. Coarse, flaky desquamation was marked on the feet and toes.

The child remained five days in the hospital and was removed against advice. During this period he was fairly comfortable. His pulse rate was from 112 to 160; most commonly it was near 140. No follow-up information was obtained.

DIAGNOSIS

The diagnosis of acrodynia is usually not difficult. The four "P's" suggested by Bilderback [35] might be changed to five, namely, pinkness, photophobia, peeling, paresthesias and perspiration. Occasionally, except for the pinkness, one or more of these symptoms may be lacking. Tachycardia and hypertension are the rule, even in afebrile patients. Burying of the head, weakness, hypotonia, drooling and irritability are present at some time in the majority of cases. Other less common findings have been mentioned under the discussion of the symptomatology and are helpful in establishing the diagnosis.

There is nothing in common between the cold, beefy, gradually fading erythema of the hands in acrodynia and the sharply defined pigmented dermatitis of pellagra. Erythema pernio may suggest acrodynia but the constitutional disturbances are lacking.

I have seen one girl, aged 7 years, with no immediate manifestations of Swift's disease except pinkness and marked desquamation of the fingers. A physician in the clinic thought that she had had scarlet fever. Her history, however, indicated the onset of irritability, photophobia, beefy hands, conjunctivitis and pronounced sweating six weeks before. These gradually disappeared, and the coldness and swelling and pinkness of the hands and fingers improved. There had been no fever, sore throat or vomiting.

35. Bilderback, J. B.: Acrodynia, J. A. M. A. **84**:495 (Feb. 14) 1925.

In France, Debré and de Cosini [22] described "nervous" forms of acrodynia, with sometimes only slight and fleeting cutaneous manifestations which would pass unnoticed in the absence of other signs. In such cases the diagnosis is to be made on the basis of the grave psychic alterations, crises of pain, muscular hypotonia, insomnia and peculiar alterations in the facies, combined with hypertension and a rapid heart beat. This type of the malady has not been reported in America.

PROGNOSIS

Acrodynia is a chronic disease, and its manifestations may be at their height for from two to four months or longer. The signs and symptoms then show a gradual irregular improvement until a complete cure is ultimately attained after from several weeks to a year. In very mild attacks, however, only six weeks may intervene from the onset to complete recovery. Second attacks do not occur.

The mortality rate in two hundred and twenty-two cases taken from the literature was 9 per cent (twenty cases). The commonest cause of death has been bronchopneumonia. In the ninety-one cases of Wood, which Fowler [36] quoted, there were five deaths, "chiefly from bronchopneumonia." Of fifteen deaths reported by other authors, bronchopneumonia was responsible for six. Deep phlegmon, "galloping consumption," miliary tuberculosis, pulmonary abscess, intussusception and thyroiditis with mediastinal infection were given as the cause of death in six other instances. In three of Wyllie's seven cases which came to autopsy, pneumonia was responsible. In another of his cases, death was unexplained pathologically or clinically. In another, vagus degeneration was the only positive pathologic finding (the patient had collapsed suddenly and unexpectedly). Death was attributed to toxemia in two other patients; in one of these it was associated with abscesses and ulceration of the mouth.

TREATMENT

As untreated acrodynia shows a wide variation in duration and severity, one must be skeptical of successful results attributed to specific forms of therapy. Such claims are especially unwarranted in reports dealing with a very few cases.

One of the first attempts to cure the disease was feeding of vitamin B, and occasional cases have been reported in which this was followed by improvement. Byfield stated that the special addition of this vitamin does not influence the course of the disease. It seems to be indicated only in exceptional cases in which there is evidence of previous deficiency.

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36. Fowler, J. S.: Erythroedema, Edinburgh M. J. **36**:177 (Aug.) 1925.

Irradiation with the mercury vapor arc lamp has been frequently employed.[37] Sweet [38] mentioned five cases in which only eight exposures, on an average, were necessary before all symptoms disappeared, and there was improvement in all cases after the first treatment. However, ultraviolet therapy is mentioned elsewhere in the literature in occasional cases, in which it seemed ineffectual. In case 3 of my series it had no apparent effect.

There is some evidence that removal of foci of infection may be beneficial. Rodda [39] reported seven cases in which the tonsils and adenoids were removed. In five, speedy recovery followed within from two weeks to two months. In two, recovery was slower, taking from two to five months. In five cases, the tonsils were not removed (the adenoids were taken out in one of these patients). Four of the patients recovered slowly within from three months to a year, and one had not improved after a year. Schwartz [24a] described a case with motor paralysis of the lower extremities in which the condition began to improve five days after tonsillectomy and adenoidectomy. Powell [40] reported rapid improvement after this procedure in one case and no striking improvement in another. In a patient of Helmholz' the condition was unimproved by operation, and death occurred suddenly two weeks later. In the third case of the present group tonsillectomy produced no striking result. Byfield had two cases in which the condition was seemingly improved by treatment of sinus infections and a third case in which radical surgical measures on the nose seemed definitely to arrest the unfavorable course of the disease.

Wyllie and Stern believed that the feeding of liver was beneficial in about half a dozen cases in which this therapy was given. They were prompted to try this because of the work of Findlay and Stern [41] with rats. These investigators fed rats a diet which was rich in vitamins and was supplied with adequate mineral elements but which provided protein only in the form of desiccated egg-white. Falling of the hair, dermatitis and loss of motor power developed in the animals. Autopsy showed peripheral nerve degeneration and round cell infiltration of the spinal cord similar to that described in Wyllie and Stern's autopsies on human beings. Rats treated with liver recovered from the disease promptly. Wyllie and Stern believed that acrodynia, correspondingly, might be caused by the absence of an unknown factor in diet. The results in their cases, however, though apparently favoring this theory, might be be equally true for any small number of patients who are hospitalized without special therapy. It does not seem logical to suppose

37. Frecker, E. W.: M. J. Australia **2**:887 (Dec. 21) 1929. Craig.[21]
38. Sweet, G. B.: Acrodynia, Arch. Pediat. **42**:543 (Aug.) 1925.
39. Rodda, F. C.: Acrodynia, Am. J. Dis. Child. **30**:224 (Aug.) 1925.
40. Powell, W.: Acrodynia, Boston M. & S. J. **194**:980 (May 27) 1926.
41. Findlay, G. M., and Stern, R. O.: Arch. Dis. Childhood **4**:1 (Feb.) 1929.

that acrodynia is a deficiency disease when the majority of patients have previously received normal diets and recover without additions to them.

The symptomatic treatment of acrodynia may include the use of sedatives for insomnia, irritability and paresthesias. Calamine lotion seems to have a soothing effect on the affected skin. Atropine is said to relieve the profuse sweating without affecting the pulse. Feer stated that it is of benefit for the cyanosis of the hands and feet, the sleeplessness and the irritable disposition. He maintains that it must be used in doses of from 1/200 to 1/100 grain (0.0003 to 0.0006 Gm.), and that poor results are obtained from too small doses. No results were obtained by Feer with the use of cocaine or ergotamine tartrate. Gavage may occasionally be indicated. Being outdoors may give relief at times. In one of my patients the parents noted constant relative relief of discomfort on the days when the child was outdoors. On days when the patient was not taken out there was regularly an increase of irritability and apparent discomfort.

NATURE OF THE DISEASE

Acrodynia is a disease of unknown etiology manifesting itself in disordered function of the vegetative nervous system. Clinically, the disordered function may reveal itself by hypertension, tachycardia, sweating, lacrimation, excessive salivation, falling of the hair, loss of teeth without involvement of the gums, neurokeratitis, hypotonia and abnormal contraction of the larger vessels of the hands and feet,[42] with capillary dilatation.

There is some evidence that the condition represents the toxic effects of a preceding respiratory infection in a susceptible person. There is perhaps more evidence that the disease is infectious in nature—perhaps a condition caused by a filtrable virus resulting in polioencephalitis in the cells of the lateral horns of the spinal cord and the higher sympathetic centers.

There is little reason to believe that acrodynia results from a vitamin or other deficiency or that it has an allergic basis.

CONCLUSIONS

1. An attempt has been made to consolidate and evaluate the knowledge of acrodynia from the time when it was first reported in the literature to the present.
2. The reports of four additional cases are given in brief.
3. Roentgen findings in the bones of the extremities are detailed.

215 East Seventy-Second Street.

42. Krogh, A.: The Anatomy and Physiology of Capillaries, New Haven, Conn., Yale University Press, 1930.

News and Comment

GENERAL

Child Health Recovery Conference.—On October 6 the Honorable Frances Perkins, Secretary of Labor, called a Child Health Recovery Conference in Washington, D. C. The Resolutions Committee brought out the following as the objectives of the meeting: "First, the location of undernourished children. Second, the initiation and development of plans to overcome as far as possible existing malnutrition and to prevent its further progress through dietary measures and in so far as necessary the institution of corrective medical procedures." The report was elaborated further as follows: "To promote such plans as may be decided upon as necessary to meet situations within different States and communities it became evident to the committee that it would be necessary to have the full and complete cooperation of the State and local departments of health, welfare and education, the National, State and local emergency relief administrations, the State and local medical and dental societies, together with the official and nonofficial National, State and local agencies concerned in the promotion of public health and child welfare. To facilitate such cooperation the committee recommends the organization of State, county and local committees, each committee being so constituted as to include in its membership representation from each of the official and so far as seems advisable the nonofficial groups above indicated. In communities where groups similarly constituted are already organized to further the objectives of the program the continuance of their work should be encouraged and supported." Reports on the organizations developed in the various states, especially New York, Pennsylvania and New Jersey, were given and further plans made for the carrying out of a nation-wide effort to correct undernutrition in children.

Volume to Honor Prof. Rocco Jemma.—Professor Jemma will shortly complete thirty years of teaching at the University of Naples and the Pediatric Clinic. A committee of colleagues and pupils, presided over by Prof. E. Maragliano, is collecting medical papers for a volume to be dedicated to Professor Jemma. Subscriptions, together with enclosures of 100 lire, should be sent to the secretary of the committee, Prof. I. Nasso, via Commenda, 9, Milan. The volume, which will probably be published toward the end of this year, will be sent to all subscribers.

DEATHS

Dr. Harrold A. Bachmann, of Chicago, attending pediatrician at St. Luke's and Children's Memorial Hospitals, died of heart disease recently at the age of 42.

PERSONAL

Dr. Leonard F. Bender has been placed in charge of the pediatric department of the Episcopal Hospital of Philadelphia.

Pediatric Biographies

MICHAEL DOERING

?–1644

THE FIRST EXTENDED ACCOUNT OF SCARLET FEVER

JOHN RUHRÄH, M.D.
BALTIMORE

The history of scarlet fever is most interesting, and while Ingrassias noted the disease and Daniel Sennert usually gets the credit for the first good description, it really belongs to Sennert's brother-in-law, Michael Doering, about whom not a great deal is known, although he was prominent in his day. He merits a higher place than has been accorded him, for he gave an excellent description of scarlet fever and of the renal complications, and he reported the results of an autopsy. He noted the rapid pulse and many other salient features, as will be seen in his account given here.

Doering was born in Breslau and practiced there, but he was also professor of medicine at Giessen and first physician to Prince von Lichtenstein. He was a disciple and friend of Fabricius Hildanus who, in his surgical writings, used material which Doering furnished.

He wrote "De febrium malignarum curatione in genere" and half a dozen other treatises on various subjects. In his "De medicina et medicis adversus iatromastigas et pseudomedicos," he gives a critique of the opinions of Paracelsus and points out errors which he recognized. He wrote on quacks and charlatans in medicine, on uterine hernia following cesarean section, on the use and preparation of opium, on the various balsams, Syrian, Egyptian, Tolutan and European, and on plague.

In the first edition of the "Opera omnia" of Daniel Sennert, Venice, 1641, there is in the "Centuria I epistolarum medicinalium" in letter 88 a short account of scarlet fever. This letter written by Doering is dated Breslau, June 25, 1625. In another letter, number 18 of a later series, dated Breslau, the eve of Easter, 1628, he gives a longer account which evidently served as a source of Sennert's article on scarlet fever, which, as previously noted, is usually cited as the first good description. He gives a good picture of the disease, the eruption with its scaling, the petechiae of the severe cases and the complications in the joints and

the kidneys. The following is a free translation from the folio edition printed at Lugduni in 1676.

LETTER LXXXVIII

My very celebrated relative and honored brother-in-law: . . . The affection which they call *die Deittelen* unquestionably is a kind of measles, consisting of somewhat clearer pustules. Philip Ingrassias already has mentioned a queer kind of it in Book 1 about swellings, p.n.p. 194, which he writes was called Rossaniam or Rossalium by his people. He says it is so called for the following reasons, because many small spots, fiery and red, are scattered over the entire body with a swelling hardly worthy of mention, like many erysipelas spots distinctly separate so that the entire body appears on fire. Of this three cases have been observed by me last spring, the first in a step-son, whom it afflicted rather severely in comparison with the rest. Another was in my brother's son and the third finally attacked Dominus A. S. himself. After the manner of measles it terminates *septiduo,* the skin breaks off and falls in scales at last from the progress of the heat as in erysipelas. It is treated like measles. May you be well and good. Written at Breslau, 25 June, 1625.

LETTER XVIII

. . . besides the mentioned kind [referring to a description of measles] there is another less usual, but contagious and mentioned to me some years before by Dominus Abraham Seiler. On the fourth or fifth day from the beginning of the attack the whole body is covered from head to heels with so much redness as if it were seized with a general erysipelas. It stops on the seventh or ninth day when the redness gradually disappears and the skin afterward comes off in scales. I have consulted various authors about the disease. I have found no one who recognized it except Ingrassias, already twice quoted. He, however, in the place referred to, page 194, mentions a peculiar variety of disease, a hidden infrequent affection of the serum of the blood as he supposes, which the Neapolitans commonly call Rossaniam or Rossalium since many fiery spots, large and small and red, with a swelling hardly worthy of mention, like many erysipelas spots set apart, as the text of Ingrassias has it, so that the entire body appears on fire. You will say that this description does not square with the disease named by me, but in first it does square, I say, for suppose you consider rather carefully the periods of this disease, its beginning, its progress, its climax and its waning and an egg is not more like an egg than this, my observed disease, is to rossalia. . . . This I can clearly state that not only in the beginning the thing is as has just been quoted from Ingrassias but also in the wane when the redness begins to disappear and the heat to slacken, spots like petechiae appear here and there.

After the disease has plainly reached its acme the entire body as Ingrassias says looks fiery, so that, not without reason, you could liken it to a general erysipelas. This redness really rises from a thinner and hotter blood and it is known that Gentilis and Nicolus have confused erysipelas sometimes with measles. From this Ingrassias in the place cited, p. 195, proves that they are very often distinct diseases, trusting not in fact in a statement of other people, he has inspected it with his own eyes and has seen it spread characteristically not only in the skin but even in the viscera, eyes and ears and indeed over the whole body. Measles usually comes on grouped, as it were, at intervals in clusters. From the Arabs he brings on Avicenna and Holy Abbas as witnesses of whom the former in fact in Book 4, sen. 4, tract 1, c.b., toward the end calls rossalia by the name Alhamica, or it is in an old codex, Alhumera, since it is somewhat different from variola and measles and he says it is less severe than both. He distinctly defines

these, l. 8. Theor. c. & c.l.4 and l. 4 Practica, c.l., under the name of rubeola, including measles meantime under the name of variola, but he says it is written in this way. In the redness there is a certain appearance which is called rubeola which is from blood, hot and subtle and not very bad. When this appearance comes to its height it is similar to grains of millet or a little larger; the color is red and the pustules do not open but they flow away as it were, resolve.

Neither, unless my conjecture positively fails me, seems to indicate rossalia but rather migliarinum, which our people are accustomed to call *die Rittelen* or *Roetheln*. Avicenna, in fact, declares this sufficiently through his conjecture when he says it is less serious or more beneficial, as I interpret him, than variola or measles. It will appear from what follows that rossalia is a severe and dangerous disease.

But Holy Abbas' description agrees most positively with migliarinum, for (1) it arises from blood hot, thin and not very bad; (2) when it comes to its height it is like grains of millet or a little bigger, whereas in rossalia for the most part nothing except a redness of the skin is found; (3) its color is uniformly red and Holy Abbas adds nothing about general redness of the body, he must on this account even less be thought to have described rossalia; (4) its pustules or, as I may more properly call them, its tubercles, never are scabbed but resolve.

[Doering goes on to describe and comment on the order of appearance of variola, measles and rossalia and then continues:]

But besides the things which have been mentioned above about rossalia, autumn past, I observed its sequelae: (1) terrible headaches, (2) catarrhs flowing toward the throat, which in some bring on coughs and inflammation of the lungs, in others, varying with their different constitutions, the dread of suffocation either on account of viscid humors flowing into the paths of the breath, or on account of inflammation of the neighboring parts; (3) a burning heat so that when the bed covers are lifted up it strikes the face as if one stood near a brazier; (4) a very great dryness and roughness of the skin; (5) continuous insomnia; (6) delirium, now more, now less serious, which, to interject this, were quieted by me very handily by putting on the hot blood of squabs, recently cut open, while they were still dripping. And these for the most part are seen at the very crisis of the disease, whence the severity and danger of the disease are abundantly clear. As the disease increases the nostrils of some patients drip with blood. The appetite is greatly diminished in all patients during the whole course of the disease and the bowels are constipated. The urine is very reddish, thick and bloody. The pulse is rather fast and hard but when the disease begins to decline both the heat and the redness begin to leave the body. Then finally are seen (1) the petechial spots as I have mentioned above, (2) redness of the cheeks and some symptoms of inflammation of the lungs, which at first on account of the universal redness of the entire body could not be noticed so positively. It terminates for the most part by a transfer of the material to the joints of the extremities with much painful swelling as is usually seen in people with true arthritis. Then the rest of the skin of the body is pulled off in scales. Lastly the feet to the nails and the calves swell and the urine gets thick and turns red. The hypochondria are swelled at first and breathing is made difficult. A little later the abdomen itself is raised into a swelling. They are like people with a beginning dropsy and are only with great labor and after many weeks brought back to their former state of health.

In what manner it was fatal to a 7 year old girl and a 9 year old boy I will now relate. When each was thought to have been brought on toward recovery, contrary to expectations, they were carried off by a new storm of symptoms and compelled to suffer shipwreck, she a little sooner and he a little later. For when

the usual symptoms as (1) intense heat, (2) general redness, (3) thirst, (4) delirium, (5) catarrh in the throat, (6) abolition of the appetite, et cetera, had abated and the skin was beginning to peel off in scales, when even the pain in the feet was getting less: Behold! on the 12th day of the disease a new rigor attacked the girl and a second and a very burning fever followed with so great a collection of bad symptoms that before her allotted span of life had passed the interchange of life with death came on. Therefore, my dear Sennert, does nobody die toward the end of the disease? I do not remember any mistake was made; in fact, aphor. 58. 1 4, comforted me at the beginning as it promises a cure of the disease if rigor comes on the patient while the patient is in a burning fever but sect. 46 of the same disturbed me at once not so much *"if the rigor comes on while the fever is not lessening it is fatal to a sick person* already weakened;" moreover indeed, with the first sect. 29 which teaches that *if rigors come on in the sixth day of fevers the indication will not be difficult.* For the twelve will correspond to the sixth according to the proposition, by which very thing the axiom of the doctors is verified: *The movement of a disease which is not fatal does not fall on equal days.* As far as concerns the boy the rossalia in fact had entirely disappeared but it left a very bad sequela for he swelled up in his feet, legs, scrotum, belly and face with some continuous redness also of the cheeks and irregular fever wore him out. He kept coughing but expectorated little and that only frothy and mucoid. He breathed with difficulty two days before he died. During the night he was seized with such a difficult respiration that he could only breathe when sitting up. He could not get comfortable anywhere on account of his great torment. He complained of a weight inside his chest. He had stertorous breathing. His whole face was now pale, then he got grayish and then spotted. His pulse failed very frequently as also did his breathing. Again and again we bystanders all thought that he was going to die immediately. After the shaking, loosening and spitting which he had he was beginning to have somewhat better breathing and a reviving heart until in the afternoon when an abscess in the lung broke and he brought up pus and black blood in coughing. So when I got busy with abstergents, with things resisting putrefaction and promoting expectoration, while meantime the necessary stimulants were given. But what happened? On the seventh day from the suffocating paroxysm the same difficulty of breathing returned and about noon killed the patient. So his brother Dominus T. S. Curalis, in this city a scabinograph, since he was desirous of knowing the cause both of the disease and of the death of his own volition, was easily persuaded that the body should be opened, a thing which was done the same day with other men present and also Dominus Franco and your son. When, therefore, I from appearances, as it abundantly appears from what has been said, which could not be misinterpreted, that the lung had been inflamed and that the inflammation had gone over into an abscess, I advised that the chest be opened first of all. When this was done the whole cavity of the chest was seen full, apparently of a yellow liquid and both lungs entirely gray and gangrenous. The last half showed in its inner substance a great abscess and the remaining substance of it when touched with the fingers easily broke down. When we came to the abdomen all the entrails were swimming in a similar liquid and the omentum seemed almost absorbed and the upper part drawn back. The liver in proportion to its individual habit was of great size, rather pale, and furnished with a long lobe where it joined the stomach so that it not only covered the whole stomach but stretched out also even into the left hypochondrium and the spleen which was small was pressed from its position toward the left kidney. The gallbladder itself was also very large and pale. This is the history of the boy. . . .

Pediatrics in Art

ST. NILUS AND ST. BARTHOLOMEW CURING AN OBSESSED

JOHN RUHRÄH, M.D.
BALTIMORE

Domenico Zampieri Domenichino (1581-1641), an Italian painter of the Bolognese school, if judged by his frescoes will rank as one of the foremost of his compatriot artists. In 1609-1610, he painted at Grotta-

St. Nilus and St. Bartholomew curing an obsessed.

ferrata frescoes which show the lives of St. Nilus and St. Bartholomew. One incident represents the Saints healing a boy described as obsessed, that is, possessed of a devil, or what would be described today as an attack of hysteria. The pose is characteristic, theatrical and appealing. It will be noted that the patient does not bite the good Saint's finger. This figure is in direct contrast with the boy with the convulsion seen in Raphael's "Transfiguration" in which the attack is of central origin.

Abstracts from Current Literature

Pathology, Bacteriology and Biochemistry

THE PLASMA PROTEINS IN RELATION TO BLOOD HYDRATION. JOHN P. PETERS, FREDERICK S. BRUCKMAN, ANNA J. EISENMAN, PAULINE M. HALD and A. MAURICE WAKEMAN, J. Clin. Investigation **11**:97 (Jan.) 1932.

In a previous paper evidence was presented to show that in chronic nephritis of the nephrotic type there was a close relation between the concentration of protein in the blood serum and the occurrence of edema, and that the reduction in serum protein which involved only the albumin fraction was chiefly the product of two factors, the loss of serum albumin in the urine and malnutrition.

In this paper are presented the results of eighty-five analyses of blood serum proteins in thirty-eight cases of acute nephritis, in patients ranging in age from 2 to 60 years, with various antecedent infections, such as scarlet fever, tonsillitis, rheumatic fever and pneumonia. Edema was regularly found when the protein concentration was below 4 per cent, but was sometimes present in the early stages of the disease when protein and albumin were within or just below the normal limits. Serum albumin reductions, when they occurred, seemed to be referable to leakage of albumin into the urine and malnutrition. Serum globulin was frequently above normal. There was no demonstrable relation between the concentration of globulin and the occurrence of edema.

GUEST, Cincinnati.

STUDIES IN THE METABOLISM OF SODIUM R-LACTATE: I. RESPONSE OF NORMAL HUMAN SUBJECTS TO THE INTRAVENOUS INJECTION OF SODIUM R-LACTATE. ALEXIS F. HARTMANN and MILTON J. E. SENN, J. Clin. Investigation **11**:327 (March) 1932.

In seven essentially normal children the effects of the intravenous injection of sodium r-lactate were studied as a control on its therapeutic use in severe acidosis. The results indicated that in the doses employed the racemic mixture was practically completely metabolized in from one to two hours. Blood samples were taken for chemical study before and at intervals of fifteen, thirty, sixty, one hundred and twenty and two hundred and forty minutes after the injection of from 4 to 7 cc. of a molar solution of the lactate. An increase of the blood sugar coincidental with a progressive disappearance of lactate from the blood indicated that the lactate was converted into dextrose. The blood inorganic phosphate, studied in two cases, decreased through the first hour and then rose. The carbon dioxide content of the blood increased, reaching its highest level usually in the second half hour after the injection; the amount of the increase indicated that the liberation of the sodium ion was practically quantitative. Excretion of excess base into the urine occurred promptly, and the induced alkalosis was of short duration. Relatively little lactate appeared in the urine.

GUEST, Cincinnati.

STUDIES IN THE METABOLISM OF SODIUM R-LACTATE: II. RESPONSE OF HUMAN SUBJECTS WITH ACIDOSIS TO THE INTRAVENOUS INJECTION OF SODIUM R-LACTATE. ALEXIS F. HARTMANN and MILTON J. E. SENN, J. Clin. Investigation **11**:337 (March) 1932.

In persons with three types of severe acidosis (nephritic, diarrheal and diabetic), studies were made of their response to the intravenous injection of sodium r-lactate as reflected by changes of the plasma carbon dioxide content. Apparently sodium r-lactate was metabolized in practically a normal fashion in these subjects. It was possible to predict fairly well the dose of sodium r-lactate necessary to bring about a desired elevation of the blood bicarbonate.

GUEST, Cincinnati.

STUDIES IN THE METABOLISM OF SODIUM R-LACTATE: III. RESPONSE OF HUMAN SUBJECTS WITH LIVER DAMAGE, DISTURBED WATER AND MINERAL BALANCE, AND RENAL INSUFFICIENCY TO THE INTRAVENOUS INJECTION OF SODIUM R-LACTATE. ALEXIS F. HARTMANN and MILTON J. E. SENN, J. Clin. Investigation **11**:345 (March) 1932.

Studies similar to those reported in the two preceding papers were made in patients with acute hepatitis, acute and chronic pyelonephritis and miscellaneous diseases. In four cases of acute catarrhal jaundice there was a slight delay in the complete metabolism of the intravenously injected sodium r-lactate. In a case of anhydremia and hypochloridemia secondary to pyelonephritis the base released from lactate was held as bicarbonate, causing persistent alkalosis which was then relieved by administration of chloride.

GUEST, Cincinnati.

CHEMICAL STUDIES OF THE BLOOD IN HIGH INTESTINAL OBSTRUCTION: I. THE DISTRIBUTION OF PHOSPHORUS AND INTRACELLULAR CHANGES. GEORGE M. GUEST and WILLIAM DEWITT ANDRUS, J. Clin. Investigation **11**:455 (May) 1932.

The distribution of phosphorus in the blood was determined in the following fractions in the whole blood, plasma and cells; inorganic; acid-soluble; organic acid-soluble or "ester"; acid-insoluble; alcohol-ether-soluble or lipin, and total. Following experimental pyloric and mid-duodenal obstruction in dogs the greatest changes in the blood phosphorus were in the fraction designated "ester-phosphorus" which is almost entirely in the cells. Changes in the chloride and carbon dioxide content of both plasma and cells were compared with concomitant changes in the distribution of phosphorus. As chloride was lost from the body as a result of vomiting there was a close correlation between the progressive decrease of chloride in the blood cells and the increase of ester-phosphorus in the cells. It seems likely that as the organic phosphorus compounds increased they were bound to the alkali in the cells from which the chloride was lost. The parenteral administration of sodium chloride solution to obstructed dogs prevented the increases of ester-phosphorus in the blood cells to about the same degree that it prevented the losses of chloride from the blood cells.

GUEST, Cincinnati.

II. THE RELATION BETWEEN "TOXEMIA" AND CHEMICAL CHANGES. WILLIAM DEWITT ANDRUS, GEORGE M. GUEST, RICHARD F. GATES and ALTA ASHLEY, J. Clin. Investigation **11**:475 (May) 1932.

In dogs with experimental pyloric obstruction, repeated injections of small doses of histamine stimulated the flow of gastric juice, and in the presence of vomiting such increased secretion resulted in more rapid losses of electrolytes and water than occurred in animals with simple obstruction. In consequence of this, death was hastened and there was a more rapid development of the whole cycle of chemical changes and symptoms which ordinarily accompany intestinal obstruction. Histamine was employed as a known substance which is closely related to toxic substances which appear in the contents of a segment of obstructed or strangulated bowel. From these experiments it is suggested that patients with intestinal obstruction plus strangulation die sooner than those with simple obstruction, not because of any specific general "intoxication" of the body tissues, but because the slow absorption of histamine-like substances from the bowel accelerates the progress of these chemical changes which occur secondarily to the losses of gastric secretions.

GUEST, Cincinnati.

EFFECTS OF VITAMIN E ON THE OVARIES OF YOUNG RATS. R. K. PAL, J. Indian M. A. **1**:428 (June) 1932.

By conducting experiments in feeding on young female rats it was found that the antisterility factor acts on the ovaries, promoting the maturation of graafian

follicles and ultimately causing frequent ovulation. This is corroborated by an increase in the metabolic rate and hyperactivity of the thyroid gland, which run concurrently with the phenomenon of ovulation. GONCE, Madison, Wis.

Nutrition

CATARACT AND OTHER OCULAR CHANGES IN VITAMIN G DEFICIENCY. P. L. DAY, W. C. LANGSTON and C. S. O'BRIEN, Am. J. Ophth. **14**:1005 (Oct.) 1931.

Water-soluble vitamin B consists of an antineuritic element designated B or B_1, and a pellagra-preventive element G or B_2. Previous researches have shown that lack of the latter causes loss of the eye lashes, conjunctivitis and ophthalmia. In only one instance in the literature was opacity of the lens mentioned as a sequel. Young healthy albino rats from different litters and from stock unaffected with congenital cataract were given a diet deficient in vitamin G. Control animals from the same litters were given the same diet with the addition of autoclaved yeast to provide vitamin G. This group grew normally and showed no ocular or other pathologic condition. In 94 per cent of the rats on the vitamin G-deficient diet cataracts developed in from sixty to eighty-seven days. One rat in which a unilateral cataract developed showed no further changes in the lens when vitamin G was added to the diet. The authors give the pathologic findings in the lids and eyeballs removed at different stages. REESE, Cincinnati. [ARCH. OPHTH.]

OCCURRENCE AND ETIOLOGY OF RICKETS. N. R. DHAR, J. Phys. Chem. **36**:1846, 1932.

The disturbance of the acid-base equilibrium resulting in a change of p_H of the blood to the acid side is the immediate cause of rickets. Dhar believes that vitamin D is essential for the proper oxidation of fats in the body; that in its absence acids accumulate, upsetting the normal proportion of fats and acids, and thereby upsetting the normal proportion of calcium in the blood. Both vitamin D and ultraviolet rays aid in the complete oxidation of fats. Dhar suggests that the administration of thyroid should prove useful in curing rickets.

KUGELMASS, New York.

INFLUENCE OF A CEREAL-FREE DIET RICH IN VITAMIN D AND CALCIUM ON CARIES IN CHILDREN. M. MELLANBY AND C. LEE PATTISON, Brit. M. J. **1**: 507 (March 19) 1932.

The article is not very well suited to abstracting, so the author's summary alone will be given.

"1. A group of children averaging 5½ years of age were given a cereal-free diet rich in vitamin D and calcium for a period of six months. The teeth of the children were defective in structure (hypoplastic), and much active dental caries was present at the beginning of the investigation.

"2. Initiation and spread of caries were almost eliminated by these diets, and the results were better than those of the previous investigation in which the vitamin D alone was increased in a diet containing bread and other cereals.

"3. Active caries was arrested on this cereal-free diet to a greater extent than in the previous investigations, when cereals were extensively used."

ROYSTER, University, Va.

THE SIGNIFICANCE OF "SLOW DULCITE FERMENTERS" IN SUMMER DIARRHEA. W. T. NELSON, M. J. Australia **1**:763 (May 28) 1932.

In a study of infantile dysentery from 1928 to 1931 in Melbourne the author has identified a strain of dysentery bacilli resembling an atypical race of Bacillus dysenteriae which are characterized by their slow fermentation of dulcite. The

organism has been isolated from the stools of 9 per cent of one hundred and twenty-two patients with diarrheal disease examined during the years 1930 and 1931. This strain of organisms resembled Bacillus flexneri in many ways, but differed from the latter in the following respects: (1) the appearance of the colonies on agar plates, (2) fermentation of dulcite, (3) no formation of indole, and (4) serologic reactions (agglutination and absorption of agglutinins).

The type of illness was milder than that caused by the Flexner bacillus, for no deaths resulted in these cases, in which 16.6 per cent of the patients suffering from dysentery due to the Flexner bacillus died. The pathogenicity of the atypical organism for human beings is confirmed by the development of agglutinins in the patients' serums and the absence of well recognized types of dysentery bacilli in the stools.

GONCE, Madison, Wis.

FACIAL GROWTH IN CHILDREN WITH SPECIAL REFERENCE TO DENTITION. (PART I), CORISANDE SMYTH and (PART II) MATTHEW YOUNG, Privy Council, Medical Research Council, Special Report Series no. 171, 1932.

This report is based on records of measurements of about twenty characters of the face, including the jaws, in a series of 1,400 children from 2 to 14 years of age. The primary object of the investigation was to establish standards of normality at the several ages for the facial characters as a basis of study of abnormal development of the face and jaws. The mean values of the facial measurements with their standard errors, deviations and variabilities are tabulated for age and stature groups.

The figures confirm the conclusion that, after complete eruption of the milk teeth, the alveolar arch increases in breadth, but not in length in the region primarily occupied by these teeth. An appreciable relationship was found between the zygomatic breadth and the width of the dental arches. While there is a slight tendency for a narrow face to be associated with a high palate, there was no tendency for a narrow face to be associated with a narrow dental arch.

LEMASTER, Evanston, Ill.

NEW RESEARCH ON ALLERGY TO EGG ALBUMIN IN INFANTS. PIERRE WORINGER, Bull. Soc. de pédiat. de Paris **30**:419 (June 21) 1932.

The author reports the results of his studies in thirty-seven cases of allergy to ovalbumin in infants ranging in age from 2 months to over 2 years. The incidence found in the children's clinic in which this condition was studied was six in a thousand. The author never obtained a positive intradermal reaction to egg albumin in an infant with normal skin. All the infants with positive reactions had eczema. Fifty per cent of the infants with eczema at some time had positive intradermal reactions. Twenty-three were boys and fourteen were girls. Twenty-two had specific antibodies in the blood; these patients are termed "holo-allergic"; eleven who had positive intradermal reactions had no specific antibodies in their blood; these are called "dermo-allergic." Only the holo-allergic infants showed a generalized reaction after taking egg albumin. No relation was found between the amount of antibodies in the blood and the severity of the eczema. Injections of egg albumin raised the titer of antibodies in the blood rapidly and did not desensitize the infants. Injections of egg albumin into normal infants did not produce allergy, nor did they produce the same specific antibodies in the blood as those which were found in the holo-allergic group; such injections produced different antibodies, which could be differentiated by means of the complement-fixation reaction. These nonspecific antibodies could be produced in dermo-allergic infants by injections of egg albumin. Dermo-allergy seems to be less stable than holo-allergy, since three of the infants tested intradermally reacted negatively after having shown repeatedly positive reactions, whereas none in the holo-allergic group lost their sensitization as determined by the intradermal reaction.

BENJAMIN, Montreal, Canada.

RESEARCHES ON THE FIXATING AND ANTIFIXATING AGENTS OF CALCIUM. G. MOURIQUAND, A. LENLIER, M. BERNHEIM and L. WEILL, Paris méd. **2**: 327 (Oct. 29) 1932.

The authors recognize three types of rickets clinically. First, the usual florid type with the classic symptoms seen in normal or overweight children. These children will respond to all antirachitic agents, and in fact will even show signs of spontaneous healing in the hospital without treatment. Second, the hypotrophic type, which shows no marked physical symptoms, but by the roentgenogram reveals epiphysitis, cupping and osteoporosis. In these cases, the condition does not heal spontaneously on the administration of cod liver oil or viosterol. Healing is quickly obtained with ultraviolet therapy in about half the cases. The third group is the hypotrophic group that does not respond to light therapy, unless calcium salts are given. The authors produced these types in white rats, as follows: The florid type was produced by the administration of the usual Papenheim diet 85. The hypotrophic type became amenable to light therapy by the addition of calcium carbonate (2 per cent to diet 85, and the hypotrophic light-resistant type, by the addition of strontium carbonate to diet 85). This group of animals could not be cured by any treatment. The authors conclude, therefore, that the clinical treatment of rickets is not only dependent on vitamin D, but on calcium fixaters and antifixaters.

SANFORD, Chicago.

USE OF ASSES' MILK IN TOXIC DEHYDRATION. LYDIA BYTCH, Rev. franç. de pediat. **8**:137, 1932.

The author believes that intoxication is produced by an inability of the organism in its disordered condition to eliminate the albumin found in cow's milk without drawing on the tissues for large quantities of water. In detoxifying this large amount of animal protein, the liver throws some into the circulation, which increases the disorder. In asses' milk, which is low in albumin, an opportunity is given for an equilibrium to be established earlier. Ten cases are given as examples. In extreme cases, the author combines it with human milk. SANFORD, Chicago.

MODIFICATIONS OF THE PROTEIN EQUILIBRIUM IN THE BLOOD SERUM IN INFANTILE SCURVY. BERTHOLD ROSENKRANZ, Rev. franç. de pediat. **8**:148, 1932.

In the average case of infantile scurvy, there is always a lowering of the total protein. The globulin fraction is not diminished as much as the serum proteins, so that the ratio is smaller than normal, and sometimes even reversed. Following treatment, the normal amount of protein is reached in from five to ten weeks. This ratio reversal appears and disappears at about the same time as the roentgen signs.

SANFORD, Chicago.

CLINICAL VALUE OF THE ESTIMATION OF THE SPECIFIC DYNAMIC ACTION OF PROTEINS. E. LESNÉ, J. A. LIÈVRE and R. DUBOIS, Rev. franç. de pediat. **8**: 188, 1932.

The technic consists of measuring the heat developed after the ingestion of 200 Gm. of beefsteak, 25 Gm. of butter, 50 Gm. of bread and a cup of tea. Thirteen cases of various conditions were studied, with enough variations to justify further study, especially in cases of acromegalia, adiposa dolorosa and hypophyseal and thyroid disturbances. No conclusions are drawn. SANFORD, Chicago.

CLINICAL IMPORTANCE OF THE CHLORIDE INDEX. ANTONIO MATTAR, Rev. chilena de pediat. **2**:421 (Sept.) 1931.

The author finds that it is quite impossible to fix a definite chloride index for acute disorders of nutrition and for the various states of dehydration. He finds

no definite or certain relationship between the chloride content of the blood and the tissues and reserve alkali.

The administration of serums on the basis of the chloride index and modified by the addition of other substances, such as dextrose, sodium bicarbonate or insulin, has not given the author the same favorable results as are reported by other authors.

SCHLUTZ, Chicago.

VISCOSITY CURVE IN TOXICOSIS: PART III. JULIUS SURÀNYI and PETER SONNAUER, Arch. f. Kinderh. **97**:230 (Oct. 4) 1932.

The viscosity curves of the blood plasma and serum of seven infants with toxicosis were studied, as well as the viscosity curves of three other acutely ill children. The results varied, and no definite conclusions were drawn. The authors state that toxicosis in infancy does not represent a uniform disease picture.

LEMASTER, Evanston, Ill.

MANAGEMENT OF LOSS OF WATER IN INFANCY. A. BRATUSCH-MARRAIN, Arch. f. Kinderh. **98**:62 (Dec. 13) 1932.

A discussion of the water balance in pyloric stenosis, diarrhea and alimentary intoxication is present. Every effort is made to supply the water requirements by oral administration when possible, but when this is inadequate, subcutaneous administration of an isotonic solution of salt and dextrose is employed. The author proposes the theory that in intestinal disturbances there is produced in the bowel a toxic substance which after absorption damages the water-binding ability of the tissues and stimulates the respiratory center in the central nervous system. The water freed from the tissues circulates in the blood as free water, not bound to the colloids, and is to a great extent excreted through the lungs at the time of the deep breathing. In this theory a much more important rôle is given to the excretion of water through the lungs than to vomiting, diarrhea and lack of fluid intake as factors causing the dehydration. Acidosis is considered to be a factor in the causation of the exaggerated respiration only in certain cases.

LEMASTER, Evanston, Ill.

WORK OF G. WEBER CONCERNING THE EFFECT OF DIFFERENT SALTS ON THE NITROGEN METABOLISM OF THE INFANT. E. ROMINGER and HUGO MEYER, Arch. f. Kinderh. **98**:91 (Dec. 13) 1932.

This article consists of a criticism of Weber's chemical studies. During the course of metabolic experiments Weber showed a negative chlorine balance to exist and explained it as being due to simultaneous increase in the output of water. Rominger and Meyer interpret his findings as being the result of a transition from a high salt to a low salt intake.

LEMASTER, Evanston, Ill.

EFFECT OF DIFFERENT SALTS ON NITROGEN METABOLISM OF THE INFANT (REPLY TO THE REMARKS OF E. ROMINGER AND HUGO MEYER). G. WEBER, Arch. f. Kinderh. **98**:93 (Dec. 13) 1932.

Weber cites the work of other investigators supporting his interpretation of sodium chloride balance, in response to Rominger and Meyer's criticisms.

LEMASTER, Evanston, Ill.

ACTION OF SPICES ON GASTRIC SECRETION: II. W. HEUPKE and E. HOLLÄNDER, Deutsches Arch. f. klin. Med. **173**:241 (June 27) 1932.

This is an exhaustive study of the effect of various spices on gastric acidity; it is to be followed by a study of their effect on mobility. It seems that anise,

fennel, ginger, paprica and cinnamon increase the acidity slightly; that pimento, saffron, clove, peppermint, parsley, nutmeg and vanilla have no apparent effect, and that mustard and white pepper diminish acidity. DOOLEY, Kent, Conn.

RAW DIET AND HEAT REGULATION. K. EIMER and F. KAUFMAN, Deutsches Arch. f. klin. Med. **173**:314 (June 27) 1932.

Comparative tests on the heat regulation and sweat secretion of persons receiving diets with high, with normal and with low sodium chloride content show that those receiving a raw diet deficient in sodium chloride generally tolerate the sweating bath better than the others. The perspiration sets in later, the temperatures of the skin and body do not rise so high, the quantity of perspiration is less and its percental as well as absolute sodium chloride content is lower. The decreased elimination of chloride of sodium in the perspiration, like that of the urine, indicates an adaptation of the organism to the decreased intake. It may also explain, however, the functional improvement in the heat regulation in that it accelerates the evaporation of sweat. Other possible causes of the improved heat regulation while a raw diet is being used may be increased elimination of heat by conduction and particularly by radiation. The latter may be due to the decreased water and sodium chloride content or to a better blood perfusion of the skin (vasomotor heat regulation). On the other hand, protein deficiency, abundant mineral content (especially potassium) and the influence of the diet on the sympathetic nervous system may also be important factors. DOOLEY, Kent, Conn.

ORIGIN AND PURPOSE OF THE PIGMENTATION OF THE CONJUNCTIVA IN VITAMIN A DEFICIENCY OF THE ADULT. A. PILLAT, Arch. f. Ophth. **128**:361 (June) 1932.

The reader is referred to the previous papers of the author on the same subject. Every epithelial cell of the conjunctiva can become a melanoblast if the tissue has to be protected against light. The protective character of the pigmentation is borne out by the fact that the pigment always covers the distal pole of the nucleus like a cap. The corneal epithelium also forms pigment, but apparently not to a sufficient degree to prevent necrosis of the cornea. The retina also is not sufficiently protected, as is shown by the hemeralopia occurring immediately after exposure to light. The author discusses the possibility of the suprarenals playing a rôle in the complex of symptoms produced by vitamin A deficiency.

KRONFELD, Chicago. [ARCH. OPHTH.]

THE HYDROGEN ION CONCENTRATION AND THE BUFFER VALUE OF THE FECES. M. KARTAGENER, Ergebn. d. inn. Med. u. Kinderh. **40**:263, 1931.

The reaction of the feces of enterically healthy adults lies mostly above p_H 7, but it vacillates symmetrically about the neutral point—even on a uniform diet—almost 4 p_H units. The breast-fed infant's stool shows usually, though not always, a reaction below p_H 7. The reaction of the stools of artificially fed infants corresponds closely to that of the adult stool. An influence of the type of feeding on the reaction of the feces is observed only in the infant. In adults and in various animals investigated, the p_H value of the feces does not depend on the type of feeding.

Not only does the fecal content of various soluble substances, which split off H and OH ions, have a bearing on the reaction, but the supernatant undissolved substances of the feces influence the reaction through the buffer phase process.

A higher water content of the feces, which results either from too short a sojourn in the colon or a changed resorption of the intestine, is found regularly in conjunction with a higher acidity.

The buffer value of the feces results chiefly from the undissolved tertiary calcium phosphate. The calcium and phosphorus content of the feces and food is therefore of fundamental importance in the buffer capacity.

There is no relationship between p_H and buffer capacity; therefore, the mere determination of the hydrogen ion concentration of the feces does not indicate an eventual intestinal secretion of acid or alkali valences.

The oral and parenteral administration of acids or alkalis does not change the p_H or the buffer value of the feces, and the same statement applies also to various states of endogenous acidosis. Through simultaneous p_H determinations and electrometric titration of feces, the author was unable to find that the intestinal wall took part in the regulation of the acid-base economy.

CAPPER, Philadelphia.

PATHOGENESIS OF RACHITIS AND CLINICAL OBSERVATIONS. L. LOEFFLER, Frankfurt. Ztschr. f. Path. **43**:231, 1932.

An attempt is made to explain rachitic skeletal changes on the basis of pathologic anatomy and comparative pathology. The author concludes that in rachitis there are a quantitative and a qualitative change in the structure of the bones. The quantitative change is the cause of the qualitative change, the essential of which is the decrease of the calcium content of the bones. The disturbance of the calcium metabolism is secondary. Because of the fact that severe respiratory disturbances, such as bronchiectasis and pneumonia, may be present in patients with rachitis, they should not be overlooked clinically. Sometimes they may be considered the cause of death in patients with rachitis.

SAPHIR, Chicago. [ARCH. PATH.]

SENSITIVITY TO LIGHT AND RICKETS. KURT HULDSCHINSKY, Jahrb. f. Kinderh. **136**:346 (Sept.) 1932.

The author describes a method of producing and measuring the erythema of the skin caused by ultraviolet radiation of known intensity, and is able to show that there is probably no correlation between sensitivity of the skin and rickets.

CLAUSEN, Rochester, N. Y.

MAY CONCENTRATED RICE GRUEL PREVENT FASTING HYPOGLYCEMIA? HERBERT SCHÖNFELD, Jahrb. f. Kinderh. **137**:47 (Oct.) 1932.

The proposed mixture prevents hypoglycemia better than the mixture of rice gruel and saline or than the carbohydrate-saline mixtures proposed by Schiff (*Jahrb. f. Kinderh.* **134**:255, 1932).

CLAUSEN, Rochester, N. Y.

FURTHER EXPERIENCE WITH A DIET OF APPLE. ANNI NOLL, Kinderärztl. Praxis **3**:296 (July) 1932.

The apple treatment for diarrhea may be employed in infants under 1 year of age, if given in the form of a soup made of apples; 200 Gm. of peeled, raw apples is passed through a fine sieve made of hair and added to 200 cc. of Ringer's solution and 500 cc. of water. This daily quantity is divided into five portions and fed every four hours. When the consistency of the stools improves, milk mixtures are fed, although a portion of the apple substance should be added for some time to guard against recurrences.

HUENEKENS, Minneapolis.

FAT AS NUTRIMENT FOR GROWTH: NATURAL, ARTIFICIAL AND CENTRIFUGATED MILK. H. ISAACHSEN, Milchwitsch. Zentralbl. **61**:1, 1932.

The nutritive value of fats, carbohydrates and proteins for the growing of young pigs and calves is discussed. Rearing may be achieved without impairment of final body weight or health when the total fat in the diet is considerably decreased. Fat thus removed, however, must be replaced by an appropriate amount of carbohydrate, while for the first three months of life the fat should be in the

same proportion as that of the corresponding natural milk. The fat of artificial milk, that is, centrifugated milk containing finely dispersed plant fat and cod liver oil, does not exert such a favorable influence in the course of digestion as whole milk.

KUGELMASS, New York.

THE INFLUENCE OF IRRADIATED OATS ON THE COMPOSITION OF THE GROWING BONES. L. PINCUSSEN, Strahlentherapie **44**:183, 1932.

Young growing rats fed with oats showed a considerable improvement of the bones when the oats were irradiated with ultraviolet rays. The manner of irradiation was of considerable influence. If the oat kernel was exposed too long to the ultraviolet rays, the formation of bone was decreased. Also the body weight, the weight of the bones and the ratio of calcium and magnesium in the bones show distinct dependent relations. Oats that have been irradiated and stored for a period act in the same way as freshly irradiated oats, but the ash content of the bones seems to be diminished.

KUGELMASS, New York.

EFFECT OF INTOXICATION WITH IRRADIATED ERGOSTEROL ON THE BASAL METABOLISM OF GUINEA-PIGS AND DOGS. A. NITSCHKE and M. SCHNEIDER, Ztschr. f. Kinderh. **52**:671, 1932.

Large does of irradiated ergosterol (5 cc.) given daily produced a definite rise in the basal metabolism of guinea-pigs and young dogs, lasting from the beginning of the administration until death occurred. The same amount of olive oil given daily did not influence the metabolic rate of control animals. The authors suggest that irradiated ergosterol causes increased metabolism by inhibiting the activity of the lymphatic system.

LEMASTER, Evanston, Ill.

ON THE ANTIRACHITIC EFFECTS OF RADIUM EMANATIONS: RESEARCHES WITH IRRADIATED MILK. C. FOLKENHEIM, Ztschr. f. Kinderh. **53**:602, 1932.

Milk treated with radium emanation failed to effect healing in a rachitic child and in experimentally produced rickets in rats.

SHELLING, Baltimore.

PASSAGE OF VEGETABLES AND FRUITS THROUGH THE DIGESTIVE TRACT IN PUPPIES. Y. OHTA, J. Pediat., Tokyo, no. 391, Dec. 20, 1932, p. 2257.

The vegetables were prepared in the form of a purée, suitable for consumption by infants, mixed with inert thorium salt and fed to puppies between the ages of 2 and 4 months. The fruits were grated after the skin and seeds had been removed. The time required for the passage of the vegetables through the stomach and the small intestine was followed by hourly fluoroscopic examinations. The results are shown in the table.

Time Required for Various Vegetable and Fruit Purées to Pass Through the Stomach and Small Intestine in Puppies

Puree	Time to Pass Stomach	Time to Pass Ileum
Carrot	4 hours, 28 minutes	7 hours, 37 minutes
Radish	3 hours, 51 minutes	5 hours, 51 minutes
Potato	3 hours, 27 minutes	6 hours, 37 minutes
Banana	4 hours, 58 minutes	6 hours, 58 minutes
Strawberries	4 hours, 2 minutes	7 hours, 8 minutes
Raw apple	4 hours, 0 minutes	7 hours, 39 minutes
Powdered apple	2 hours, 49 minutes	5 hours, 55 minutes
Powdered apple peel	4 hours, 34 minutes	8 hours, 27 minutes

KATO, Chicago.

TREATMENT WITH A DIET OF APPLE. S. NEMOTO, J. Pediat., Tokyo, no. 391, Dec. 20, 1932, p. 2282.

Nemoto prepared apple purée by grating the pulp of ripe apples and sweetening it with saccharin. Treatment with the apple purée was tried in thirty-seven cases of diarrhea. He found that the infants took the purée well; their appetites remained good and consequently their nutritional condition remained undisturbed.

KATO, Chicago.

Prenatal Conditions

ANAL AND URETHRAL ATRESIA WITH PENOSCROTAL HYPOSPADIA. M. SCHONFELD, Časop. lék. česk. **70**:921 (June 26) 1931.

Except for a mild scoliosis and the anomaly about the genitalia to be described, the boy is well nourished and developed. The right testis is large and covered by a well developed scrotum; a well developed prepuce fuses with the frenum below; there is a solid glans with no urethral dimpling or opening. At the penoscrotal juncture there is a tiny opening, just admitting a small probe; this opening is patent, and the canal passes toward the coccyx. Gas, urine and meconium fragments are passed from this opening. The scrotal raphe passes from the opening to the sacral dimple. There are apparently no sphincter muscles. The comparative anatomy, embryology and different types of rectogenital anomalies are discussed. A photograph and schematic drawings are presented.

STULIK, Chicago.

THE PLACENTA AND THE RETICULO-ENDOTHELIAL SYSTEM, ESPECIALLY ON THE ROENTGENOGRAPHY OF PLACENTA. S. KATSUYA, Jap. J. Obst. & Gynec. **15**: 77 (April) 1932.

The author emphasizes the rôle of the placenta as an organ belonging to the reticulo-endothelial system and having as much significance as the liver and spleen in that respect. Furthermore, just as roentgenography of the liver and spleen has been possible, so can roentgenography of the placenta be accomplished by the injection of thorium dioxydsol. He states that thorium dioxydsol can be absorbed by the reticulo-endothelial system, and, moreover, can markedly absorb the roentgen rays. Experiments along these lines were conducted on guinea-pigs, rabbits and mice. Roentgenography was successful in all the animals used.

Katsuya believes that roentgenograms can demonstrate decreased functions of the reticulo-endothelial system, especially in the liver, and explain the formation of the toxemias of pregnancy. The author also believes that roentgenography of the placenta may be applied to the diagnosis of abdominal pregnancy and placenta praevia.

MICHEL and ADAIR, Chicago.

HISTOLOGIC INVESTIGATION OF THE DIGESTIVE TRACT OF THE HUMAN FETUS: III. DEVELOPMENT OF RECTUM AND VERMIFORM PROCESS. D. CHO, Jap. J. Obst. & Gynec. **15**:88 (April) 1932.

The author carried out his investigations on thirty-six fresh fetuses, ranging from 12 mm. to 47 cm. in length.

I. Rectum. The intestinal villi and glands are generated from the epithelial intestinal canal. The epithelium is two layers in thickness at from 12 to 20 mm. of fetal length. At 30 mm. several layers appear and longitudinal folds form. At 55 mm. vacuoles form and hollow areas appear in the epithelial layer. Creases of epithelium result and villi appear. Mesenchymal tissue then enters the villi. At 60 mm. villi were found in the rectum. At 24 cm. these rectal villi decrease in size.

Glands were seen to be formed by the increase of granulated cells at the villous fundus. These glands could be seen in the rectum in fetuses of 75 mm. The glandular epithelium became progressively transparent, and at 19 cm. became transparent. Goblet cells appeared at 55 mm.

The external wall at 12 mm. is mesenchyma. At 30 mm. the circular muscle differentiates and figures of three layers are evident. The muscle of the mucous membrane is found to be developed at 19 cm. At 55 mm. longitudinal muscle appears.

The serous membrane is seen when the fetus reaches 15 cm. At 37 cm. the solitary lymphatic nodules are recognized. The intermuscular nerve plexus appears outside the circular muscle when the fetus is 30 cm. in length.

II. Vermiform appendix. The villi and glands are formed by the same changes as in the colon, and primordial villi appear, as in the ascending colon, at 90 mm. Glands are clearly observed at 12 cm. The villi gradually increase up to 24 cm. of fetal length. At 36 cm. they are gradually reduced, and at 47 cm. are very short.

Circular muscle appears at 37 mm., and longitudinal muscle at 90 mm. Nerve plexuses appeared at 55 mm., and at 90 mm. they connect with each other on a string. Lymphatic nodules were found in 21 cm. fetuses. Lymphocytes were seen to originate by circumscript increase of the cells in the peculiar layer, that is, from cells in the connective tissue.

MICHEL and ADAIR, Chicago.

HEPATIC AUTOLYSIS OF THE RABBIT FETUS. T. KOSAKA, Jap. J. Obst. & Gynec. **15**:97 (April) 1932.

Kosaka found that the optimal p_H for autolysis of the fetal rabbit liver is 4 or 5, and the higher the p_H value the less autolysis takes place. He found that with a p_H of 7.8 less liver autolysis occurred than with a p_H of 4.

Furthermore, he demonstrated that the earlier the gestation period, the more intense is the autolytic action. He noted the decreased autolytic action with increase of gravid days. At term, or just before parturition, the autolytic action is at its weakest.

The author calls attention to the fact that, as a self-preserving action of polycyesial animals, autolysis is essential for processes of absorption and maceration of the dead fetus, in order to prevent the maintenance of pregnancy of the surviving fetuses.

MICHEL and ADAIR, Chicago.

A FETUS WITH CLEFT IN PALATE AND DEFORMATION OF LIMBS WITH MENINGEAL HERNIA CAUSED FROM CONGENITAL MENINGEAL PAPILLOMA. H. FUJIMORI, Jap. J. Obst. & Gynec. **15**:246 (June) 1932.

Fujimori followed a primipara, aged 17, through the entire period of gestation. Her past history was of no significance. The pregnancy progressed without complications, and she was admitted to the hospital in labor, at term. The abdomen presented signs of oligohydramnios. The presenting part was irregular and movable; it was difficult to differentiate the head or buttocks. The fetal heart tones were audible, and the bag of waters was intact. After a labor of sixteen hours a monster was delivered.

The fetus was full term, 45 cm. in length, and weighed 2,000 Gm. The head presented a hernial malformation; clefts were observed in the lips and palates; the right thenar presented an outward talipomanus, the left one an inward talipomanus, and both feet were clubbed. The child died on the fourth day with symptoms of meningitis.

At autopsy the head was found to consist of three fist-sized tumors, with the cranium lacking over this area. The ventricles were rudimentary in size. The cerebral arachnoid was covered with straw-colored papillomatous creases, the size of rice kernels. In the cleft of the alveolus a tooth was found. The hands and feet were clubbed.

The author ventures the opinion that mechanical pressure from the uterine wall, due to the oligohydramnios, favored growth of a papilloma and of a newly generated tooth by chronic stimulation and was a factor in producing the monstrosity.

MICHEL, Chicago.

SITUS CORDIS INVERSUS. H. Vos, Nederl. tijdschr. v. geneesk. **76**:1217 (March 12) 1932.

Two cases of situs cordis inversus congenitalis are reported. In one there was pure, noncomplicated dextrocardia, with inversion of the aorta, without other anomalies of the heart, in a girl, aged 14 years.

In the other, dextrocardia was one of several serious congenital anomalies of the heart and of other organs in a child, dying at the age of more than 2 years.

The results of the roentgenologic and electrocardiographic examinations are discussed, and the postmortem observations in the second case are reported.

VAN CREVELD, Amsterdam, The Netherlands.

Acute Infections

A TEN-YEAR STUDY OF TOXIN-ANTITOXIN MIXTURE AND THE SCHICK TEST IN THE CONTROL OF INSTITUTIONAL DIPHTHERIA. C. C. YOUNG and C. D. CUMMINGS, Am. J. Pub. Health **22**:1151 (Nov.) 1932.

In an institution of over one thousand children, Schick tests made in 1920 showed that 15 per cent had a positive reaction. This group was reduced to 1 per cent in 1921 by the use of toxin-antitoxin. In 1931 this same group was retested, and 15 per cent were again found to have positive reactions. From this study it was felt that artificially produced immunity, as measured by the Schick test, remains for approximately seven years. This was borne out by the return of clinical diphtheria to the institution after this period.

PARKER, Rochester, N. Y.

THE VALUE OF PLASMOCHIN IN THE TREATMENT OF MALARIA INFECTION ENCOUNTERED IN SOME CASES OF BLACK WATER FEVER AND QUININE HEMOGLOBINURIA. JAMES C. PATTERSON, Am. J. Trop. Med. **12**:363 (Sept.) 1932.

The author gives a brief review of the literature on the frequency with which malarial parasites are found in the peripheral blood of patients with blackwater fever and the type of parasites encountered. The accepted form of treatment is also discussed, and four cases of blackwater fever with parasites in the peripheral blood, in which the patients were treated with plasmochin until quinine could be safely given, with recovery in all cases, are reported. BURPEE, Augusta, Ga.

THE NEWER CONCEPTION OF DIPHTHERIA IMMUNIZATION. ROBERT A. STRONG, Arch. Pediat. **49**:614 (Dec.) 1932.

The writer reviews the early history of diphtheria immunization, and discusses the present generally accepted methods of procedure, particularly as regards the use of diphtheria toxoid.

WADDELL, University, Va.

THE INFANTILE PARALYSIS EPIDEMIC OF 1931 AND A SUBURBAN HOSPITAL WITH AN ANALYSIS OF FIFTY-ONE CASES. EVERETT COLGATE JESSUP, Arch. Pediat. **49**:794 (Dec.) 1932.

The writer describes the way an epidemic of infantile paralysis was met by a small hospital and its community. An analysis of the cases of fifty-one patients admitted to the hospital is presented, with no conclusions as to the efficacy of serum treatment. It is suggested that to be really effective the administration of serum should antedate the onset of the preparalytic stage, anterior poliomyelitis perhaps being susceptible of treatment by convalescent serum only in a prophylactic way, resembling measles, chickenpox and mumps in this respect.

WADDELL, University, Va.

THE NEUROLOGIC COMPLICATIONS AND SEQUELAE OF MENINGOCOCCUS MENINGITIS. WILLIAM C. COOK, R. A. LYON and A. GRAEME MITCHELL, Arch. Pediat. **49**:807 (Dec.) 1932.

1. In the years 1930 and 1931 there were eighty-seven patients in the Cincinnati General Hospital with meningococcic meningitis, of whom thirty-six survived and of these, ten had neurologic complications.

2. Twenty-five patients were studied from four to twenty-one months after their discharge from the hospital. Of these, sixteen had no complications at the time of discharge, and in none of them did sequelae develop during the period of observation.

3. There were ten patients who had complications at the time of discharge. During the period of observation of eight of them, four recovered, one improved and two became worse. One patient died of an abscess of the brain.

4. All neurologic complications, except those of the auditory nerve, gradually improved.

5. Vigorous treatment by lumbar and cisternal punctures apparently had no effect on the production of neurologic complications, with the possible exception of the development of radiculitis in one instance. WADDELL, University, Va.

THE TREATMENT OF COUGHS WITH SUPRARENAL: III. WHOOPING-COUGH. ORVILLE BARBOUR, Arch. Pediat. **49**:816 (Dec.) 1932.

The usual remedies now employed in the treatment of whooping-cough are classified, and their therapeutic value is discussed. The writer feels that none of them can be depended on to give prompt and continued relief. On the contrary, he feels that good results follow the use of suprarenal extract, thyroid and suprarenal extracts, or thyroid, suprarenal and a nonspecific protein. One-half grain (0.0324 Gm.) of suprarenal extract taken by mouth at intervals of from two to three hours was prescribed. In more severe cases the patients received one-fourth grain (0.0162 Gm.) of thyroid and one-half grain (0.0324 Gm.) of suprarenal extract every three hours. Patients who did not respond promptly to the combined therapy received in addition several injections of nonspecific protein in the form of lactalbumin.

Eighty-five patients were treated, and the results of treatment were as follows: "In 50 per cent (44 cases), there was a striking ameloriation of the symptoms within one to two days, and a complete disappearance of the cough within one to four weeks, following the use of suprarenal. In 20 per cent (14 cases), a prompt and increasing relief followed the administration of thyroid and suprarenal. A complete cure occurred within one to four weeks. The condition of 25 per cent (23 cases) of the patients responded very well to the combined endocrine and protein therapy. In four cases (5 per cent) the treatment seemed to have little or no effect."

The writer discusses at some length possible explanations for his apparent success, with frequent references to the literature. WADDELL, University, Va.

THE USE OF CONVALESCENT SERUM AND HUMAN BLOOD IN SUSPECTED POLIOMYELITIS. ORVILLE BARBOUR, Illinois M. J. **43**:82 (Jan.) 1933.

Two cases of definite acute poliomyelitis, two of meningitis and ten of suspected poliomyelitis are reported. Convalescent serum or whole blood was used in thirteen of the fourteen cases. The pathologic changes, spinal fluid findings, diagnosis, possible efficacy of convalescent serum and human blood, indications for their use and the routes of administration are discussed. To be of any real value, the serum must be given before the virus has involved the central nervous system. One cannot without fear of contradiction diagnose acute poliomyelitis without the presence of paralysis. Instead of waiting to make a definite diagnosis in each case before instituting therapy, one should have in mind prevention rather than specific treatment. Would it not be sound prophylactic therapy to administer convalescent serum or whole blood in suspected cases until its further use is contraindicated?

AUTHOR'S ABSTRACT.

THE PREPARATION OF DIPHTHERIA TOXOID BY TREATMENT OF THE TOXIN WITH ONE PER CENT FORMALIN AND PRECIPITATION WITH ACETONE. AUGUSTUS WADSWORTH, JAMES J. QUIGLEY and GRETCHEN R. SICKLES, J. Bact. **25**:82 (Jan.) 1933.

An earlier study, according to the authors, has established the fact that as soon as the detoxification of diphtheria toxoid is complete, the diluted solution of formaldehyde may be eliminated by precipitation with acetone without apparent injury to the toxoid; further experiments were undertaken with larger quantities of formaldehyde and shorter incubation at the ordinary incubator temperature. The results indicate that the detoxification is complete after from four to five days' exposure to a diluted solution of formaldehyde (1 per cent) at 36 C. After four, five and ten days' exposure, the preparations were precipitated with acetone and restored to one-half the original volume with physiologic solution of sodium chloride. Toxicity and antigenic action were determined by the methods recommended by the National Institute of Health; in addition, tests of antigenic activity, such as the titration of the antitoxin in the blood of immunized animals, were made, and flocculation values were determined. Slight but definite toxicity remained after the fourth day period of exposure which, however, had disappeared in the fifth and tenth day preparations. The flocculation values were well maintained although the time of flocculation was greatly prolonged. The preparations incubated with 1 per cent formaldehyde for four and five days apparently possessed antigenic properties equivalent to other preparations of toxoid which had been tested. The preparations incubated for ten days showed a decrease in antigenic values.

The results thus demonstrate that diphtheria toxoid can be prepared by treatment of the toxin with large amounts of diluted formaldehyde, incubation at 36 C. and precipitation by acetone, without apparent loss of antigenic value in five days, whereas the Ramon procedure requires from four to six weeks and special incubation at 39 C.

STOESSER, Minneapolis.

STUDIES OF SCARLET FEVER: I. THE ALLERGIC VERSUS THE TOXIN-ANTITOXIN HYPOTHESIS. SANFORD B. HOOKER, J. Immunol. **24**:65 (Jan.) 1933.

The author takes up, one by one, the various arguments of the students of scarlet fever who interpret its mechanism in terms of allergic rather than of toxin-antitoxin reactions. He presents logical objections to all these arguments, and strongly supports the toxin-antitoxin theory.

The article is largely a critique, with little presentation of new scientific data; however, as such, it merits the careful consideration of all students of scarlet fever.

FOTHERGILL, Boston.

THE BACTERIOLOGICAL DIAGNOSIS OF DIPHTHERIA: RELATION BETWEEN MORPHOLOGY AND VIRULENCE OF THE CORYNEBACTERIUM. J. C. WILLETT, N. NAGLE and C. L. PFAU, J. Missouri M. A. **30**:1 (Jan.) 1933.

Studies were made in order to determine, if possible, the virulent and avirulent strains of this organism by microscopic examination alone. The attempt was made to separate the diphtheroid from the diphtheria bacilli, and the pathogenic diphtheria bacilli from the nonpathogenic.

The organisms were divided into eight types. The even-staining organisms were classified as A (typical) and B (atypical); the barred, as C (typical) and D (atypical); the granular, as F (typical) and G (atypical), and involution forms as E.

In 2,851 microscopically positive cultures from the nose and throat made from 1924 to 1930, the morphology was compared with the virulence for animals; the classic long granular bacilli designated as type F were virulent in 75 per cent of the cultures, and type B, representing the diphtheroid group, in 13 per cent. The remaining types were found to be virulent in approximately 50 per cent of the cultures.

In 1932, the classification was modified to include three groups of Corynebacterium. Group I includes types F, G and A, which were virulent in over 90 per cent of the cultures; group II includes types C, D, E and some strains of G, which were virulent in less than 50 per cent of the cultures, and group III includes type B, which is known to be avirulent.

In all, the morphology was compared with the virulence test in more than 4,000 cases over a period of eight years. As a result of these comparisons the Corynebacterium can for practical public health purposes be divided morphologically into three groups.

Group I is considered virulent and comprises 40 per cent of positive cultures. Group II, comprising 35 per cent of positive cultures, includes organisms that cannot be differentiated morphologically into the virulent and avirulent strains. The forms in group III, comprising 25 per cent of the cultures which had previously been considered as positive, are now classed as diphtheroids and are known to be avirulent.

BERGER, Kansas City, Mo.

CURRENT PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES FROM DECEMBER 4 TO DECEMBER 31, 1932. Pub. Health Rep. **48**:63 (Jan. 20) 1933.

The undue prevalence of mild cases of influenza, which had started in the southern and western states, continued at a high level during December, increasing in the northern and eastern states. Typhoid fever, poliomyelitis, smallpox and meningococcus meningitis occurred at much lower incidences than in recent years. Reports of scarlet fever and measles showed a normal seasonal increase, with a slight seasonal decline for diphtheria. In large cities the death rate from all causes rose from 11.2 for the preceding period of four weeks to 13.4 for the month of December.

LEMASTER, Evanston, Ill.

DIPHTHERIA IMMUNIZATION. W. BYRD HUNTER, West Virginia M. J. **28**:554 (Dec.) 1932.

The importance of immunization against diphtheria between the ages of 6 months and 1 year is stressed. This must be kept constantly in the minds of the mothers. There is need of educational work by the state, county, city, medical societies, schools, insurance companies, clubs, physicians and other agents. Methods are mentioned.

There is brief discussion of the various immunizing agents and of the author's comparative results with them (reactions, follow-up Schick tests, etc.).

The author's methods thoroughout are rather unique and should be of interest to any pediatrician.

SHAWKEY, Charleston, W. Va.

EXPERIMENTAL STUDIES ON THE FILTRABLE MICROBE OF SCARLET FEVER AND ON ACTIVATORS IN RELATION TO HEMOLYTIC STREPTOCOCCI. T. TOYODA and Y. FUTAGI, Brit. J. Child. Dis. **29**:253 (Oct.-Dec.) 1932.

The authors took blood cultures in ten typical cases of scarlet fever, using the culture mediums of Tarozzi-Noguchi. They failed to obtain the filtrable coccus which Di Cristina claims as the causative agent of scarlet fever. S. Meyer obtained similar negative results in Germany.

Furthermore, the authors failed to discover Zlatogoroff's filtrate microbe and Mandelbaum's diphtheroid bacillus which have been put forward as activators of the streptococci that cause scarlet fever. They are convinced that the less virulent type of streptococci may change into the virulent hemolytic streptococci without the aid of any other micro-organism.

Stake was able to produce a scarlatiniform rash by the intramuscular injection of the culture filtrate of the hemolytic staphylococcus. The material was obtained from the submental gland of a patient with scarlet fever. Criteria for attributing

the rash to staphylococci are: 1. No hemolytic streptococci are detected either in the throat or in the localized focus. 2. The rash blanches when the staphylococcus antitoxin is applied. The authors have encountered only three cases fulfilling these conditions.

LANGMANN, New York.

A CASE OF RECURRING SERUM RASH. E. W. GOODALL, Brit. J. Child. Dis. **29**: 288 (Oct.-Dec.) 1932.

A girl 2 years of age was given 12,000 units of antitoxin for faucial diphtheria. There was no history of a previous injection of serum. Three days later erythema developed on the trunk and limbs, and in the course of six weeks the rash reappeared on five occasions. In between these reappearances the skin was clear. In the author's experience and from his review of the literature of serum sickness, this case appears to be unique.

LANGMANN, New York.

MALARIA IN NATAL. C. E. L. BURMAN, South African M. J. **5**:591 (Sept. 24) 1932.

Burman reports that the nightly ingestion of a teaspoonful of a mixture of equal parts of sulphur and treacle or the taking of a 5 grain (0.3 Gm.) sulphur pill three times a day in the case of adults is sufficient to permeate the superficial tissues and produce the aroma necessary to prevent mosquitoes from biting.

GONCE, Madison, Wis.

THE MODIFIED DIAZO REACTION IN THE DIAGNOSIS OF TYPHOID FEVER. P. H. SYMONS, South African M. J. **6**:594 (Sept. 24) 1932.

Symons found a modified diazo reaction to be positive in the first ten days of typhoid. However, the test does not possess a high degree of specificity, often being positive in influenza and other conditions, and consequently is of value only in excluding typhoid within the first ten days in a suspected case.

GONCE, Madison, Wis.

VITAMIN A IN THE TREATMENT OF PNEUMONIA. A. J. ORENSTEIN, South African M. J. **6**:685 (Nov. 12) 1932.

The author found that treatment with large doses of a highly potent vitamin A preparation did not influence the progress of pneumonia as seen in native mine workers.

GONCE, Madison, Wis.

THE LIFE-CYCLE OF MALARIA PARASITES IN HUMAN BLOOD. A. BONFA, South African M. J. **6**:796 (Dec. 24) 1932.

The author summarizes his article thus: "The life-cycle of the plasmodia in human blood is as follows:—The saliva of the mosquito haemolyzes and keeps separate the red blood-corpuscles, and kills the few white corpuscles that are present in the small wound. The sporozoites attack and penetrate the red blood-corpuscles, and thus protected, they enter the general circulation through the wound on the blood-vessel or through the lymphatic circulation. The sporozoites become amoebulae, grow bigger, and take food from the plasma, even before the red blood-corpuscles are reduced to shells only. The infected red blood-corpuscles will stop in the brain capillaries, because either they are too big to get through or because they clump together. The sluggish brain circulation in some capillaries will cease completely. The schizonts will exude toxins, killing or haemolyzing the blood-corpuscles in the vicinity, and will sporulate, and, eventually, the merozoites will penetrate haemolyzed or dead red blood-corpuscles, such penetration being favoured by the fact that there is no blood circulation to keep the red blood-corpuscles on the move.

"Therefore, malaria is a blood disease with special localization in the brain, where conditions are such that multiplication of relatively small numbers of plasmodia is possible, without much interference by phagocytes and antitoxins.

"The theories above enumerated give, in many instances, a simple explanation of facts, that in malaria cases appear absolutely unexplainable. These theories also offer a guide for the treatment of malaria. For instance, it will be useless to administer quinine to a patient with tertian if the fever is at its height, because the plasmodia have then penetrated into red blood-corpuscles, where they have sealed themselves, thereby being perfectly protected from antitoxin and quinine. On the other side, it will be indicated to give quinine a few hours after the attack, as advised by Philip Manson-Bahr, because then the amoebulae have grown very big, and are absorbing plasma from the blood; the amoebulae have then destroyed the whole of the protoplasma blood-corpuscles, and any quinine then floating or dissolved in the blood or any substance poisonous to plasmodia formed in the blood by quinine will be absorbed by the parasites."

GONCE, Madison, Wis.

SYMPTOMATIC MANAGEMENT OF TETANUS WITH AVERTIN. E. DROST and A. BUXELLO, Beitr. z. klin. Chir. **155**:311, 1932.

This article presents a complete and sane discussion of the use of avertin in the management of tetanus. Whereas it has been reported that patients have been cured with massive doses of antitoxin alone, with massive doses of avertin alone or with antitoxin and avertin combined, the author comes to the conclusion that both antitoxin and avertin are necessary in various stages of the treatment. He uses avertin with discretion. He gives enough so that the patient will have rest from his symptoms during the night, and when the patient can be watched more carefully during the day, the author uses milder narcotics, such as morphine, chloral hydrate, magnesium sulphate and chloroform. He reports such a case with favorable results. He realizes very well, however, that patients with severe cases and short incubation periods do not react well to this treatment, no matter what other treatment they have received.

His average dose of avertin is 0.1 Gm. per kilogram of body weight.

RUBIN, Boston.

THE TREATMENT OF POLIOMYELITIS WITH BLOOD TRANSFUSIONS FROM CONVALESCENT DONORS. E. SCHOTTMÜLLER, Deutsche med. Wchnschr. **59**:43 (Jan. 13) 1933.

The author treated successfully two patients with poliomyelitis in the acute stage of the disease by transfusions of blood from donors who had recovered from infantile paralysis. He advocates this method of treatment, because, according to him, convalescent donors can be made easily available, and by transfusions larger quantities of immune bodies can be introduced than if the serum is used intramuscularly or intraspinally. He thinks that transfusions of the blood of convalescents in treatment of poliomyelitis will be the method of choice in the future. Donors may be used for from two to six years after they have recovered from poliomyelitis.

KERESZTURI, New York.

PREDISPOSITION TO DIPHTHERIA ACCORDING TO AGE. F. REICHE, Med. Klin. **28**:73 (Jan. 15) 1932.

This is a statistical study of the incidence of diphtheria in the city of Hamburg. It is evident that in the last wave of epidemics, the higher incidence of diphtheria has shifted toward the age group of from 5 to 15 years. In former epidemics, the age group between 2 and 4 years was mostly affected. In recent years it has been more between 4 and 11 years, with the peak at 8 years of age. In mortality figures there is also some change, as the highest mortality is in the second five year period of the child's life. Reiche thinks that this phenomenon can be explained

only on the basis of individual predispostion in some way connected with age. Increased virulence of the organism could not account for lower mortality and morbidity in the younger age groups. The former theory of gradually developing immunity due to contact with the infected organism seems to be poorly supported by the recent findings. In view of these facts, the theoretical foundations of active immunization have to be reexamined.

ZENTAY, St. Louis.

TREATMENT OF GONORRHEA OF INFANTS WITH A SILVER PREPARATION. E. KLAUSNER and K. SALOMON, Med. Klin. **28**:519 (April 8) 1932.

A silver preparation, containing 15 per cent of silver and, through the high content of glycosides, amounting to 63 per cent, possesses an unusually high antiphlogistic action. The treatment consisted of irrigations of the vagina with a 5 to 10 per cent solution three times a day. After the irrigations, a whole or one half of a suppository of the preparation was introduced into the vagina. This treatment proved to be effective and without any untoward effects, as it does not cause irritation or pain. The healing was rather rapid. This silver preparation is recommended as a good preparation for prophylaxis in institutional cases of vulvovaginitis.

ZENTAY, St. Louis.

Chronic Infections

COMPARISON OF NEOARSPHENAMINE AND ARSPHENAMINE: RESULTS AND REACTIONS IN NINE HUNDRED AND NINETY-NINE PATIENTS UNDER TREATMENT OR OBSERVATION NOT LESS THAN SIX MONTHS. J. P. THORNLEY, Arch. Dermat. & Syph. **27**:185 (Feb.) 1933.

The object of this report is to compare the results and reactions observed in the treatment of a series of 999 patients with syphilis. Neoarsphenamine and arsphenamine were used. The drugs were administered in the same dosage, the same dilution, and by the method of gravity.

The results of serologic tests indicated equal efficacy in the two drugs; fewer reactions occurred in the patients who received neoarsphenamine (9 per cent as contrasted to 15 per cent in the group that received arsphenamine).

The author believes that the number of reactions was smaller in his group given neoarsphenamine because of the method of administration—gravity and dilution as compared with the usual syringe and concentration method.

EKERMEYER, Iowa City.

ACCIDENTAL TRANSMISSION OF SYPHILIS BY BLOOD TRANSFUSION. C. D. POST and G. C. COONEY, J. A. M. A. **100**:258 (Jan. 28) 1933.

A case is described in which a secondary syphilitic rash developed in a girl 14 years of age after she had received a transfusion with blood obtained from her brother. According to the donor, the chancre was not present at the time of transfusion but appeared four or five days later.

CARO, Chicago. [ARCH. DERMAT. & SYPH.]

TUBERCULOSIS IN INFANCY AND CHILDHOOD. JOHN W. S. BLACKLOCK, Glasgow M. J. **118**:241, 1932.

In 1,800 consecutive autopsies, 283, or 15.7 per cent, of the subjects showed tuberculous lesions. In the first three years of life more than 90 per cent of the patients with tuberculous lesions died as a result of tuberculosis, while from the fourth to the thirteenth years, the incidence was 75 per cent. The incidence of sex was the same for the first year, but thereafter was greater for girls.

The distribution of the primary site was as follows: abdominal, 35.7 per cent; thorax, 61.1 per cent; cervical glands, 2.1 per cent, and not found, 2.5 per cent. Eighteen of the 101 patients with abdominal primary foci had ulcerations; the other

83 has only enlarged mesenteric glands in various stages—caseation, calcification and the like. Of those in whom the type was determined, 81.8 per cent had bovine tuberculosis. Of the patients with bovine tuberculosis, 75.9 per cent died of this disease; of those with the human abdominal type, 83.3 per cent died. Forty-one and seven-tenths per cent had a family history of human strains of tuberculosis, and 6 per cent, of bovine strains.

The thoracic primary focus was usually in the lungs (85.5) or the tracheobronchial glands. It was usually situated subpleurally and was localized bronchopneumonia. The majority of subjects showed secondary lesions in the glands. Miliary lesions of the lungs and pleural involvement were frequent. Associated ulceration of the small intestine was present in half the cases. In 14.5 per cent of those considered to have primary thoracic lesions, no pulmonary foci could be found. The bacilli had spread to the tracheobronchial glands. In only 2.9 per cent had the tuberculous lesion of the primary thoracic type not been responsible for death. In only 1.5 per cent was the lesion in the process of healing. Calcification of the primary foci is extremely infrequent. This is probably due to the lack of vitamin D, as Scottish children of the poor and working class do not get cod liver oil as a routine.

A family history of tuberculosis was common; the incidence was higher in city children than in country children. Two thirds of the patients died during the first six months of the year, from January to June, when children are more confined and also when infection of the upper respiratory tract is prevalent.

The author makes a plea for the prevention of tuberculosis by seeking the source, by the removal of patients with open cases from contact, by treatment in a preventorium and by the pasteurization of milk. SNELLING, Toronto, Canada.

TUBERCULOUS ENTEROCOLITIS. J. B. CLELAND, M. J. Australia **2**:271 (Aug. 27) 1932.

Of 111 postmortem examinations at Adelaide Hospital in cases of advanced pulmonary tuberculosis, 50 per cent showed tuberculous ulcers of the intestines.

GONCE, Madison, Wis.

CONGENITAL TUBERCULOSIS WITH ISOLATION OF VIRULENT ORGANISMS FROM THE BLOOD. A. COUVELAIRE and M. LACOMME, Bull. Soc. d'obst. et de gynéc. **21**:660 (Nov.) 1932.

The mother of the infant was 30 years old and had previously been delivered of two infants who are now living. She had shown signs of active pulmonary tuberculosis eight years previously. The symptoms subsided, but they recurred three years later and persisted until her third gestation. At that time she showed roentgenographic signs of pulmonary tuberculosis and tubercle bacilli in the sputum. Gestation was comparatively uneventful and terminated early in the ninth month with a delivery by forceps. The tuberculous process seemed to have been stirred up by the labor, and the mother died twenty-three days later.

The infant weighed 2,870 Gm. and was transferred immediately after birth to an isolated crib. He received B C G on the second, fourth and sixth days. On the fourth day a tuberculin test was negative. The infant developed normally and at 19 days of age weighed 3,240 Gm. The weight then became stationary, and the infant's temperature, which had been rather constant at 37 C. (98.6 F.), rose to 39 C. (102.2 F.). Fever persisted, and there was loss of weight. At the age of 30 days an intradermal tuberculin test was negative. The following day suggestive signs developed in the right apex, and a roentgenogram showed diffuse clouding and mottling of the pulmonary fields except for the left base. Anorexia and diarrhea soon appeared, and the cough became worse. Tubercle bacilli were recovered in great abundance from the pharynx. The pulmonary process advanced rapidly, and effusion on the right side from which tubercle bacilli were recovered developed. The patient died at the age of 41 days, his weight having dropped to 2,800 Gm.

Necropsy disclosed massive pulmonary tuberculosis, with generalized miliary tuberculosis. Injections of tissue from various organs produced generalized tuberculosis in guinea-pigs but did not kill rabbits. The organisms were considered as being of the human type. Blood drawn by sinus puncture at the age of 28 days when injected into a guinea-pig caused tuberculosis. This organism was also considered to be of the human type. The authors state that this is a case of congenital tuberculosis caused by the human type of tubercle bacillus. Although the infant received B C G at an early age, the authors do not believe that the extensive pathologic processes presented by the infant could have developed within the infant's postnatal lifetime.

GLASER, Rochester, N. Y.

GENERALIZED INTESTINAL TUBERCULOSIS WITH TUBERCULOMA OF THE CECUM. H. GRENET, R. LEVENT and MOURRUT, Bull. Soc. de pédiat. de Paris **30**:265 (April) 1932.

A girl, aged 2½ years, had marked swelling of the glands on both sides of the neck and a large abdominal mass. She was cachectic, but at no time did she have any intestinal symptoms. From the necropsy observations, it is thought that she had primary intestinal tuberculosis with secondary involvement of the mesenteric and cervical lymph glands and the lungs. The tracheobronchial glands were not involved. Tubercle bacilli were found in abundance in all the tissues that showed tuberculous infiltration.

BENJAMIN, Montreal, Canada.

THE RECOGNITION AND CONTROL OF TUBERCULOSIS IN CHILDHOOD. H. VON METTENHEIM, München. med. Wchnschr. **80**:245 (Feb. 17) 1933.

Mettenheim discusses the importance of controlling the spread of tuberculosis and gives general advice to practitioners. All children in whom there is even a suggestion of tuberculosis should be given the percutaneous tuberculin test of Moro. Repeated roentgenograms should be taken of those showing a positive reaction. The children with evidence of pulmonary involvement should be isolated, carefully observed and treated in institutions. In doubtful cases examination of the gastric contents for tubercle bacilli is helpful.

BRAHDY, Mount Vernon, N. Y.

MOST FREQUENT FORMS OF TUBERCULOSIS IN CHILDHOOD. ANNA ZAHALEK, Časop. lék. česk. **70**:1763 (Dec. 18) 1931.

A review of the literature is followed by a discussion of the various types of tuberculosis, such as accidental infantile infection, insidious infection and multiple reinfection. The usual sequence is: primary alveolar infection, exudation, formation of endotoxin and perifocal lymphocytic infiltration. This perifocal lymphocytic infiltration is the most characteristic and most frequent reaction in tuberculosis of childhood. Invasion of the hilus is a secondary manifestation. Perifocal infiltration is also found about active bronchial glands and about secondary pneumonic foci. In healing there is complete resorption of the infiltration and primary infection or resorption of the perifocal zone and calcification of the primary focus, calcification of the hilar glands, fibrosis of the infiltrated sites, atelectasis or bronchiectasis. In many cases there is involvement of the interlobar pleura with possibly an exudate. The residue of healing is fibrosis of the interlobar tissue with thickening of the roentgenographic lines. The various clinical manifestations, such as scrofulous facies, cervical adenitis, mediastinal glands and the tuberculotoxic effect in phlyctenular, exudative and psychic reactions, are discussed. Roentgenograms are most valuable in the diagnosis of all except microscopic pulmonary invasions, and the d'Espine sign is valuable in the diagnosis of mediastinal infiltration. The value of the various tuberculin tests and the importance of protecting infants from tuberculous environment are emphasized.

STULIK, Chicago.

EXPECTORATION OF THE CASEOUS REMAINS OF A TUBERCULOUS HILAR LYMPH NODE. N. MALMBERG, Acta pædiat. **13**:357 (June 6) 1932.

It not infrequently happens that a caseous lymph node discharges its contents into a bronchus or into the trachea. Most of these episodes pass unrecognized during life, but in a certain number of patients—particularly when there is a sudden rupture—symptoms of suffocation are produced, and in the majority of such cases described in the literature the patient has died.

A robust boy, aged 4 years, was under observation for a primary tuberculous infiltration of the upper lobe of the left lung. About seven weeks after the subsidence of a high temperature which was probably the initial fever of the tuberculous infection, he coughed up a firm caseous mass, 4 by 14 mm. in size, having the appearance of partly cooked meat. On section this mass was found to be the remains of an infiltrated lymph node and to contain tubercle bacilli. With regression of the parenchymal lesion, the patient recovered. The prognosis was good.

McINTOSH, New York.

FREQUENCY OF TUBERCULOUS INFECTION AMONG INDIGENT CHILDREN OF STOCKHOLM. G. SVEDENIUS, Acta pædiat. **13**:429 (June 6) 1932.

The Moro percutaneous test was used for 673 children in a seaside colony for poor children. Subjects known to be exposed to tuberculosis were not included. Fifteen per cent of the patients 5 years of age gave positive reactions. This level was maintained up to the age of 8 years; at 9 years there was a sudden rise to 32 per cent. At 14 years of age, more than half the children give a positive reaction to the tuberculin test. The results obtained are believed to underestimate the actual frequency of tuberculosis, because only a single test was made in each instance.

McINTOSH, New York.

TUBERCULOSIS AMONG CHILDREN IN HELSINGFORS. H. SÖDERSTRÖM, Acta pædiat. **13**:432 (June 6) 1932.

An intensive survey made in the winter and spring of 1931 and comprising 5,058 children of all ages up to 15 years showed that the curve of persons giving positive reactions to the Moro percutaneous tuberculin test rose steadily from 2.4 per cent at 1 year of age to 28.4 per cent at 5 years, 44.6 per cent at 10 years and 58.3 per cent at 15 years. The general level of the curve is definitely lower than in previous surveys, showing an improvement in the circumstances which limit the spread of tuberculosis. A comparison of the percentages of persons giving positive reactions in two schools representing different standards of living bears out the familiar tenet that poverty and overcrowding favor the dissemination of the disease.

Among 6,910 school children examined clinically, 186 (2.7 per cent) were found to be suffering from demonstrable tuberculous disease. Only 8 per cent of these had frank pulmonary involvement; 24 per cent had tuberculosis of the bronchial nodes, and 47 per cent were scrofulous.

McINTOSH, New York.

CYTOLOGY OF THE SPINAL FLUID IN TUBERCULOUS MENINGITIS. I. TAILLENS, Acta pædiat. **13**:444 (June 6) 1932.

If the spinal fluid from a patient with tuberculous meningitis is left for from four to six hours in the counting chamber at room temperature, the polymorphonuclear leukocytes disintegrate, and the final differential count gives 100 per cent mononuclears.

McINTOSH, New York.

Internal Diseases

MECHANISM OF ANEMIA IN INFANCY. HUGH JOSEPHS, Bull. Johns Hopkins Hosp. **51**:185 (Oct.) 1932.

The author established arbitrary units of blood formation and blood destruction which were found to be equal when the hemoglobin was stationary. The rate of blood formation was obtained by the reticulocyte count; the rate of blood destruction, by determinations of urobilin in the stool. Using these figures as an index, the author attempts to show when exacerbations or remissions occur in anemia. Many cases are cited.

LYTTLE, New York.

PERLÈCHE: A CONSIDERATION OF ITS ETIOLOGY AND PATHOLOGY. M. H. GOODMAN, Bull. Johns Hopkins Hosp. **51**: 263 (Nov.) 1932.

Perlèche is a disease more commonly occurring in infants and children, but also quite often seen in adults. It affects the skin and mucous membrane of the commissures of the lips, causing inflammation with maceration, thickening and desquamation of the epidermis. Sometimes fissures form which may be painful and which bleed when the mouth is opened widely. The disease runs a course of a few weeks or longer, but has a tendency to relapse and may become chronic, especially in adults. Among children it is contagious, and epidemics have occurred in institutions.

Careful bacteriologic studies were made in two cases, and biopsies were made in one case.

The author concludes as follows:

1. A specific etiology of perlèche has not been determined.

2. A case of chronic perlèche in an adult is reported, and also one of an acute type in a child.

3. A survey of the literature and the cultural study of the two cases would suggest that perlèche may be primarily produced either by streptococci and staphylococci or by a fungus organism. However, there remains the possibility that an as yet undiscovered virus is the primary agent and that these organisms are secondary invaders.

4. The histopathology of the case studied showed a chronic granuloma.

LYTTLE, New York.

A NOTE ON THE COMMUNICABILITY OF COLDS. PERRIN H. LONG, ELEANOR A. BLISS and HARRIET M. CARPENTER, Bull. Johns Hopkins Hosp. **51**:278 (Nov.) 1932.

It is generally accepted that the common cold is extremely contagious during the primary stage. It has been thought, but not proved, that possibly the common cold might also be contagious before the actual onset of symptoms. The testing of this belief is not feasible, because it does not lend itself easily to experimental procedures. Under controlled conditions, in two of nine chimpanzees typical common colds developed following contact with a person whose cold was late in the incubation stage.

LYTTLE, New York.

INTRAVENOUS UROGRAPHY IN CHILDREN. FRANCIS F. SCHWENTKER, Bull. Johns Hopkins Hosp. **51**:318 (Nov.) 1932.

Pyelograms of fifty-six children were made after the intravenous injection of iopax. A dose of 3.3 cc. of a 30 per cent solution per kilogram of body weight was found satisfactory. This is approximately three times the adult dose per kilogram. Good results were obtained in only 35 per cent of infants under 2 years, but in 65 per cent of children over this age.

Pyelograms obtained by both the retrograde and the intravenous method from ten patients are compared. The outlines of the urinary tract are identical with each method.

The author thinks that the chief advantage of intravenous pyelography is its simplicity. One does not hesitate to make intravenous pyelograms in cases in which cystoscopy would be considered only after all other diagnostic methods had failed.

LYTTLE, New York.

THE SPECTROGRAPHIC DETECTION OF LEAD IN THE BLOOD AS AN AID TO THE CLINICAL DIAGNOSIS OF PLUMBISM. P. G. SHIPLEY, T. F. M. SCOTT and H. BLUMBERG, Bull. Johns Hopkins Hosp. **51**:327 (Nov.) 1932.

Since it is known that lead is transported in the circulating blood, it seemed possible that it might be present in the blood in amounts sufficiently great to be detectable by spectrographic analysis. This we found to be the case in the samples of blood from patients with lead poisoning which we have so far examined.

The method is as follows: Five cubic centimeters of blood is withdrawn from a vein into glassware that has been cleaned by washing in strong nitric acid and rinsing in distilled water. Two cubic centimeters of strong, distilled sulphuric acid is added to the blood in a silica ashing dish, and the whole is charred over an open flame. Ashing is completed in from twelve to twenty-four hours in an electric muffle furnace at a temperature not exceeding 500 C. The resultant ash is powdered and triturated in an agate mortar and is then ready to be examined spectrographically.

The ash is burned in an electric arc between graphite electrodes. The light is concentrated by a condensing lens and focused on the slit of a Hilger E_1 spectrograph. The spectrum is recorded on a photographic plate and the *raies ultimes* of lead are sought by direct comparison with the spectrum of a known lead compound photographed directly beneath that of the ash.

By this method the authors have succeeded in demonstrating appreciable quantities of lead in the blood of nine children who were suffering from various manifestations of plumbism. The blood of six normal children used as controls either gave negative results or showed questionable evidence of traces.

LYTTLE, New York.

PARATHYROIDECTOMY IN GENERALIZED OSTEITIS FIBROSA CYSTICA. JOHN FITCH LANDON, J. Pediat. **1**:544 (Nov.) 1932.

This report concerns a white boy, 2½ years old, with osteitis fibrosa cystica. A roentgenogram showed several cystic degenerative regions in the bones. The serum calcium values varied from 10.5 to 19.4 mg., and the serum phosphorus values, from 2.15 to 5.5 mg. Administration of viosterol and yellow phosphorus produced no apparent effect. However, following the surgical removal of three small masses of parathyroid tissue, the boy's general condition became much better and roentgenograms demonstrated marked improvement in the cystic areas and an increase in deposits of lime salt in the bones. This case is of interest because it concerns the youngest patient in whom this condition has been reported and because it is the only report of parathyroidectomy in a child.

LEMASTER, Evanston, Ill.

LOBAR PNEUMONIA IN INFANTS AND YOUNG CHILDREN. CLIFFORD G. GRULEE and PHILIP MULHERIN, J. Pediat. **1**:593 (Nov.) 1932.

The records of one hundred and sixteen cases of lobar pneumonia in children treated in the past ten years at the Presbyterian Hospital, Chicago, were studied. Of these patients, 25 per cent were less than 1 year old; 57 per cent, from 1 to 5 years, and 18 per cent, from 6 to 12 years. Nearly two thirds of the cases occurred from December to May. The percentage of cases starting with vomiting

increased with age. Convulsions occurred at the onset in only four patients. In only nine children was the cough distressing, so that therapeutic measures for its control seemed needed. Diarrhea occurred only in those children who had received castor oil before admittance to the hospital. Crisis was not as usual as in the adult, whereas lysis was more frequent, and intermittent and low fevers were not uncommon. Otitis media occurred in thirty-two cases and empyema in only three patients. There were seven deaths; six of the patients were under 1 year of age. In the treatment, nursing care was emphasized; otherwise, the treatment was purely symptomatic.

LeMaster, Evanston, Ill.

Congenital Complete Heart Block: Report of an Additional Case. Joseph Witter Godfrey and Robert Sterling Palmer, New England J. Med. **207:** 575 (Sept. 29) 1932.

A case of congenital complete heart block, the twenty-third such case in the literature, is reported.

The differential diagnosis of slow pulse in childhood is practically limited to heart block, either congenital or acquired, and cretinism. The subject of this report was a boy 9 months of age; birth was uneventful; cyanosis was not noted at that time. Physical examination showed that the skin was very white; the heart rate was 48, which was accelerated to 54 when the child cried; there was a very loud systolic murmur, with no thrill. Three months later, in addition to the systolic murmur, there were a high pitched, blowing diastolic murmur and an apex impulse, and the left border of dulness was 5 cm. to the left in the fourth interspace. Cyanosis and clubbing of the fingers or toes were not found.

An electrocardiogram showed complete heart block and definite deviation of the right axis. A roentgenogram taken at a distance of 7 feet (212 cm.) showed a bulge in the upper left border of the heart, in the region of the pulmonic conus. The Wassermann reactions of both parents were negative; the child was not myxedematous, and the physical examination clearly revealed a congenital defect in the heart.

Gengenbach, Denver.

Perinephritic Abscess in Infants. Roger C. Graves and Sidney J. Solomon, New England J. Med. **207:**819 (Nov. 10) 1932.

Perinephritic abscess in infants is decidedly uncommon and, when present, its clinical signs may be most obscure. The authors report two cases.

In case 1, a boy, aged 2 years, was admitted to the hospital on Aug. 16, 1930, in a semistuporous condition. The temperature was 103.2 F.; the pulse rate, 128, and the respiratory rate, 48. The abdomen was prominent, with a soft distention; there were no palpable masses or muscle spasm; the white cell count was 46,000, and urinalysis gave negative results. On August 26, signs of right lobar pneumonia appeared. On August 29, the temperature was 102.2 F.; the pulse rate, 160; the respiratory rate, 50. Death occurred suddenly at 6:00 p. m. the same day. The white cell count made the preceding day was 105,000. At autopsy a perinephritic abscess on the right side, which had ruptured into the right pleural cavity, was found. There was collapse of the right lung with early pericarditis by direct extension. There were multiple abscesses in the right kidney.

In case 2, a girl, aged 28 months, was admitted to the hospital on Jan. 16, 1931, because of fever, pain in the back and lameness, with a decided limp of the left leg and tenderness and fulness in the left lumbar region. A perinephritic abscess was suspected because of the previous case. Urinalysis showed an occasional red blood cell but no pus. Roentgenograms disclosed no evidence of disease in the bones of the lumbar spine and pelvis. The fulness became more marked after a few days; the white cell count was 18,000. On January 22, a cystoscopic study was done. A pyelogram of the left side suggested a dilated renal pelvis. Operation was advised and performed. The abscess cavity reached upward back of the kidney almost to the diaphragm and downward toward the

pelvis. No abnormal growth in the kidney could be palpated. Culture of the material obtained at operation revealed the hemolytic streptococcus. The patient was discharged from the hospital in good condition on February 13, and she returned on March 29 presenting the appearance of robust health. The limp on walking had almost disappeared.

GENGENBACH, Denver.

ROENTGEN-RAY FINDINGS IN ERYTHROBLASTIC ANEMIA. F. B. MANDEVILLE, Radiology **15**:72 (July) 1930.

Erythroblastic anemia, as described by the author, is a hemolytic anemia occurring in infancy and early childhood, characterized by enlargement of the spleen, dark urine containing urobilin, moderate leukocytosis and an extremely large number of erythroblasts in the circulating blood. Its etiology is obscure, and only one patient with the disease is known to have reached adult life. Roentgenologic manifestations in the bones have been noted as follows: (1) thickening of the medullary portion of the frontal, parietal, temporal and occipital bones; (2) thinning of the inner and outer surfaces of the bones of the vault of the skull; (3) a mottled appearance of the medullary portion of the cranium in the earlier stages, described by several authors as a spongy or porous appearance; (4) striations perpendicular to the tables of the skull in the later stages, with the diploe gradually assuming a thickness equal, at times, to as much as four times its normal width; (5) irregular trabeculations in the pelvis, vertebrae, ribs, clavicles and scapulae, the appearance of which is apparently due to the formation of new bone (there is evidence of slight rarefaction within the trabeculated areas, which has been described as a porous appearance; this is evidently due to localized destructive bone changes); (6) definite thinning of the cortex of the long bones, an important and rather constant finding; (7) rarefaction of the shafts of the long bones, the medulla of the long bones demonstrating increased radiability, which characteristic is well illustrated and described by some authors as a transparent medulla; (8) trabeculations of the medulla of the long bones, more marked in the metaphyses, which appear as sharp and finely pencilled trabeculae near the ends of the bones (some authors have described them as trabeculations perpendicular to the cortex, but this Mandeville has found not to be the rule; the trabeculation may affect all of the bones of the body); (9) normal joints, no pathologic change having been noted to involve the surfaces or spaces of the joints; (10) no periosteal elevation, periosteal involvement not being recorded, and (11) absence of pathologic fractures. Distinction of these manifestations from those produced by certain other anemias, chloroma, syphilis and metastasis is difficult.

CAMP. [Am. J. Roentgenol.]

A CASE OF DWARFISM AND CALCINOSIS. REGINALD LIGHTWOOD, Arch. Dis. Childhood **7**:193 (Aug.) 1932.

The clinical and pathologic observations in a case of calcinosis with widespread arterial degeneration, fatal at the age of 2 years and 3 months, are recorded. The etiology of the arterial disease in this case is quite unknown, nor is its relation to the disordered calcium and phosphorus metabolism understood. An extreme obliterative endarteritis predisposed the patient to local tissue degenerations, and a slightly excessive intake of lime, in the virtual absence of normal growth of bone, may have been a factor in the deposition of calcium in the damaged arteries, degenerating tissues and in the bones. These secondary changes may have been dependent on phasic disturbances in the calcium-phosphorus ratio sufficient to produce pathologic calcifications, disordered growth of bone and latent rickets.

The calcinosis in this case was not due to excessive intake of vitamin D. Other cases found in the literature, such as those of Bryant and Hale White (1901), Hodgson (1815) and possibly Kennedy (1932), make it clear that there are conditions in childhood, other than hypervitaminosis D, which can give rise to

pathologic calcification, and that some of these cases are associated with extreme arterial degeneration. For this rare group the descriptive clinical title of "calcinosis with arterial degeneration" is suggested. KELLY, Milwaukee.

TWO UNUSUAL EXAMPLES OF OSTEOGENESIS IMPERFECTA. JAMES CROOKS, Brit. M. J. **1**:705 (April 16) 1932.

The author classes osteogenesis imperfecta, osteitis deformans and generalized osteitis fibrosa as related pathogenically to calcium and phosphorus metabolism and mentions the possibility of the action of the parathyroid gland. He then cites two cases; one was that of a child suffering from osteogenesis imperfecta whose mother suffered from osteitis deformans. The second was a case of a child born by cesarean section of a mother crippled from osteogenesis imperfecta. The child also suffered from the same condition, and the family history shows that this is the fourth generation suffering from the same disease.

ROYSTER, University, Va.

PYLORIC AND DUODENAL STENOSIS IN MONGOLIAN CHILDREN. C. PAGET LAPAGE, Brit. M. J. **2**:350 (Aug. 20) 1932.

The author discusses the rarity of pyloric stenosis in mongolian children. He then reports two cases with operation, a tumor having been found at operation in both cases, with death subsequently from respiratory infection. A case is then reported in which an operation was declined. Post mortem there was a stricture of the duodenum due to a band of mesentery. The last case is one of what appears to be pylorospasm in a mongolian child who recovered from the condition after medical treatment.

ROYSTER, University, Va.

RECURRENT BLEEDING FROM THE EYES. DAVID M. GREIG, Edinburgh M. J. **39**: 628 (Oct.) 1932.

In a critical review Greig mentions numerous cases of idiopathic hemorrhage from the eyes, sometimes in considerable amount. A large citation from the literature is drawn on. Some of the cases began in childhood at about 10 years of age. In one case, under Greig's own observation, a girl of 14 years had bleeding from the left caruncula lacrimalis, recurring at monthly intervals until menstruation was established. Most of the cited cases were in females, but not always connected with the onset or irregularity of menses. In some instances no ocular change was found before or after the bleeding. Greig believes that this recurrent ocular manifestation is only one local evidence of a vasomotor lesion, participated in by the distribution of the autonomic nervous system in the orbit and precipitated by a psychic emotional disturbance. NEFF, Kansas City, Mo.

RENAL DWARFISM. KEMPSON MADDOX, M. J. Australia **1**:487 (April 9) 1932.

Three cases of renal rickets are described. The theories of its etiology are discussed, and the author suggests the possibility of prenatal renal damage resulting from a toxemia of pregnancy. This seemed to be true in one of his cases, but in the children of a group of women who had suffered from toxemias he was unable to demonstrate renal insufficiency. He finds the changes of the blood and bones to be identical with those of acute florid rickets.

An attempt was made to reproduce the disease in puppies. One kidney was surgically delivered and irradiated with roentgen rays. Several days later the other kidney was removed, and frequent examinations of the blood and roentgen studies were made. There was a very high mortality among the animals; it was concluded that a nephritis could be produced but that it was not identical with that of renal dwarfism. Some impairment of growth also occurred, but it was not dwarfism.

TENNEY, Madison, Wis.

HODGKIN'S DISEASE: A TREATISE (PART III). LESLIE UTZ and LEILA KEATINGE, M. J. Australia **1**:521 (April 16) 1932.

Following a review of the literature on the prognosis and treatment of Hodgkin's disease the authors present the records of twenty-five patients with the disease treated with serum from a chicken. The serum is obtained from a hen into which an emulsion of fresh gland from a patient with Hodgkin's disease has been intravenously injected twelve days previously. Excellent results in bringing about a return of the glands to a normal size and in restoring the patients to normal health and activity are reported. The greatest length of time any patient has been under observation is three years.

GONCE, Madison, Wis.

DISTURBANCES OF GLUCOSE TOLERANCE DURING THE COURSE OF INFECTIONS. MARGARET LONG and EWEN DOWNIE, M. J. Australia **1**:647 (May 7) 1932.

The authors report observations on seven patients in whom a loss of dextrose tolerance, first observed during the course of an infection, was subsequently followed by definite improvement and finally by complete restoration of the tolerance curve to normal.

GONCE, Madison, Wis.

IDIOPATHIC STEATORRHEA (GEE'S DISEASE): A NUTRITIONAL DISTURBANCE ASSOCIATED WITH TETANY, OSTEOMALACIA AND ANEMIA. T. I. BENNETT, D. HUNTER and JANET M. VAUGHAN, Quart. J. Med. **1**:603 (Oct.) 1932.

The basis of this report consists of a thorough study of 15 cases of celiac disease or idiopathic steatorrhea in adults. Clinically, the cases presented the following features: fatty stools, enlarged colon, tetany, osteomalacia, anemia, lesions of the skin and infantilism.

Increased amounts of fat in the stools and disturbances of calcium metabolism were alone common to the entire group. Evidence of osteoporosis and florid rickets was revealed in the roentgenograms. Glossitis occurred in 5 cases, and achlorhydria was found in 2 of 12 patients examined. Six of 8 cases showed dilatation of the colon. Diarrhea was present in 5 and had occurred in the past in 12; tetany was found in 14, lesions of the skin, in 7; clubbing of the fingers, in 9, and opacities of the lens in 6.

The blood picture was normal or showed: (1) hypochromic anemia, (2) hyperchromic megalocytic anemia or (3) erythroblastic anemia. These usually responded to the administration of marmite or iron.

The curves for blood sugar were low; the urea content was often below normal, and the serum calcium was usually low. Estimations of the calcium balance showed high figures for fecal output and very few figures for urinary output.

The authors suggest that the clinical picture is dependent on a disturbance of gastro-intestinal function resulting in deficient production, absorption or utilization of one or more essential factors.

A good bibliography and reports of cases accompany the article.

BRADFORD, ROCHESTER, N. Y.

CASE OF POLYSEROSITIS. NORMAN CARMICHAEL, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 166; in Edinburgh M. J., October, 1932

This girl, aged 8 years, has had an extended series of ailments, although the present general condition is good and the child entirely happy. Beginning about two years before she presented herself for treatment, she seemed to have a rheumatic pericarditis, followed in a few days by right-sided pneumonia; the diseases required about two months to disappear. In the subsequent three weeks the right pleural cavity became full of fluid. Three months later, the abdomen suddenly began to swell, owing to a large collection of fluid. The child had intercurrent measles and scarlet fever. The peritoneum is still producing large quantities of clear fluid which must be repeatedly tapped. Although tubercle bacilli have not been found, polyserositis is usually considered due to tuberculosis. The liver and spleen are enlarged.

NEFF, Kansas City, Mo.

CONGENITAL HYPERTROPHIC STENOSIS OF PYLORUS. GERTRUDE HERZFELD, Tr. Edinburgh M. J. Med.-Chir. Soc., 1932, p. 167; in Edinburgh M. J., October, 1932.

Herzfeld summarized the results in about fifty cases observed during two and one-half years. The average age of the patients at the time of operation was 7 weeks. Death occurred in 26 per cent; in only 6 per cent, those who died within three days, could death be regarded as the result of the operation itself. Most of the deaths occurring later were due to an infective enteritis, and the number would have been lowered if nursing conditions had been better, as in private cases.

The operation for pyloric stenosis is preceded by gastric lavage and complete emptying of the stomach, though the infant is allowed to occupy itself with a feeding of dextrose and water when the local anesthesia is begun.

Five infants, thriving well after the operation, were shown.

NEFF, Kansas City, Mo.

CASE OF SEPTIC BRONCHITIS. CHARLES MCNEIL, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 169; in Edinburgh M.J., October, 1932.

Following tonsillectomy in a girl, aged 7 years, a right-sided bronchitis probably due to aspiration of infected material developed. The acute stage was passed, but a paroxysmal cough and mucopurulent expectoration remained to suggest that bronchiectasis might ensue. NEFF, Kansas City, Mo.

CASE OF PNEUMOTHORAX. LEWIS THATCHER, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 170; in Edinburgh M. J., October, 1932.

This boy, aged 8 years, had suffered from right pneumothorax complicating acute lobar pneumonia limited to the right interscapular space. The roentgen picture showed a large, dense shadow at the root of the lung. In treatment, air was aspirated three times from the pleural cavity, and breathing exercises were performed when the pneumonic fever had subsided. A complete recovery took place.

NEFF, Kansas City, Mo.

CONGENITAL HYPERTROPHIC STENOSIS OF THE PYLORUS. LEWIS THATCHER, Tr. Edinburgh Med.-Chir Soc., 1932, p. 171; in Edinburgh M. J., October, 1932.

The feature of this case was the failure of the stenosis to become acutely obstructed, and at 4 months of age, though the weight was only 6 pounds (2,700 Gm.) and the emptying time much retarded, the patient had begun to improve satisfactorily under lavage, acid milk feeding and peritoneal dextrose solution. The diagnosis was suggested largely because of the striking waves of gastric peristalsis. No operation was performed. NEFF, Kansas City, Mo.

PULMONARY ABSCESS IN CHILDHOOD. J. HUTINEL, R. KOURITSKY and E. NICHOLAS, Arch. de méd. d. enf. **35**:697 (Dec.) 1932.

While pulmonary abscess in the very young cannot be considered as common, sufficient examples have been reported in recent years to justify more careful study. The authors discuss in great detail the etiology, the clinical features, the bacteriology, pathology, diagnosis and treatment of localized suppuration in the parenchyma of the lungs; roentgenologic criteria are particularly stressed, and the monograph is freely illustrated with roentgenograms of numerous patients.

The condition may be primary, as with adults, and appear as a sequel to bronchopneumonia, or secondary, the usual form found in young subjects, as a complication following operative procedures in the upper respiratory tract or the aspiration of foreign bodies. Diagnosis is much more difficult in early life, and pus must be looked for in the vomitus rather than in the sputum; in infancy also

the frequency of encysted pleural suppurations renders differential diagnosis occasionally almost impossible. Bronchial suppurations developing about an old area of bronchiectasis also constitute a frequent source of error. In spite of the inaccessibility of the condition in some cases, spontaneous cure is so commonly noted that the prognosis is fairly good in these instances and with abscesses incident to foreign bodies removed by the bronchoscope, the likelihood of complete recovery is excellent.

AMESSE, Denver.

CHRONIC HYPERTROPHY OF THE LIVER (FATTY LIVER). H. GRENET, R. LEVENT and MOURRUT, Bull. Soc. de pédiat. de Paris **30**:398 (June 21) 1932.

A boy, 9½ years old, had a very large liver. He was observed six years previously, when an exploratory laparotomy was done and a piece of the enlarged liver was removed and examined histologically. It showed marked fatty degeneration. The boy had developed fairly normally since the operation and now presented the same physical finding, viz., a markedly enlarged liver without splenomegaly or other abnormalities. It is thought that the boy could not have lived and developed during six years if the entire liver were similar to the piece removed at operation, and it is suggested that a benign tumor deeply situated in the liver may account for the carrying on of liver function.

BENJAMIN, Montreal, Canada.

ERYTHEMA MULTIFORME: ARTHRITIS; BILATERAL ORCHITIS; ENDOCARDITIS; RÔLE OF ENTEROCOCCUS. J. HALLÉ, GIRARD and ODINET, Bull. Soc. de pédiat. de Paris **30**: 413 (June 21) 1932.

A boy 12 years old was admitted to the hospital with erythema multiforme, multiple arthritis and bilateral orchitis. On aspiration of the left knee, fluid was obtained from which enterococci were cultured. Aortic endocarditis developed. Two cultures of the blood were negative. The infections of the joints, testicles and heart were probably due to the same organism. The child showed no marked symptoms, but the lesions were not subsiding. His parents were instructed to keep him at rest in bed, and he was to be observed further.

BENJAMIN, Montreal, Canada.

THE DIAGNOSIS OF THYMIC HYPERTROPHY IN THE INFANT. G. MOURIQUAND and M. BERNHEIM, Paris méd. **2**:372 (Nov. 5) 1932.

Thymic hypertrophy is rare in the new-born, but it can exist. The most prominent symptoms are stridor, cyanosis and dyspnea. Percussion may show nothing. An enlargement of the mediastinum, which moves on respiration, is the characteristic roentgen finding. Congenital deformity of the heart, tuberculous glands and mediastinal tumors may give the same picture. The treatment is roentgen exposure.

SANFORD, Chicago.

CASE OF INFANTILE LEISHMANIASIS. M. CARBONE, Prat. pediat. **10**:215 (May) 1932.

Dr. Carbone reports the case of a Neapolitan child, aged 4 years, who had an irregular fever, anemia, tremendously enlarged spleen and evidences of loss of weight; punctures of the bone marrow yielded the parasites of leishmaniasis. Treatment consisted of intravenous injections of a 1 per cent solution of antimony and potassium tartrate commencing with 1 cc. and gradually increasing to 8 cc. until fifteen injections had been given at three day intervals. Apparently the child was completely cured. The duration of the disease was about five months. The author emphasizes the importance of early diagnosis and early treatment.

DOOLEY, Kent, Conn.

PERICARDITIS. JUAN CARLOS NAVARRO and SARA DE ALZAGA, Arch. argent. de pediat. **3**:408 (July) 1932.

The authors report two cases of pericarditis, one occurring in a child of 11 years, and one in a child of 6 years. In both cases the condition was of rheumatic origin.

In the older child, endocarditis preceded the development of the pericarditis. In the younger child, no endocarditis was observed. Treatment consisted in the use of salicylate by mouth, by bowel and by the intravenous route. Both patients recovered.

SCHLUTZ, Chicago.

PATHOGENESIS OF ECLAMPSIA IN DIFFUSE GLOMERULONEPHRITIS. JOSE BONADA and F. NICOLA REYES, Arch. de pediat. d. Uruguay **3**:216 (May) 1932.

The author reports a case of acute glomerulonephritis in a boy, aged 10, who presented eclamptic attacks. Compression of the jugular veins produced these attacks at will. Compression of the same veins produced an instant exacerbation of the hypertension of the cerebrospinal fluid and a pronounced change in the dynamics of the intracranial circulation. The author believes that mechanical factors play a fundamental part in the development of eclampsia. Renal insufficiency and the retention of metabolites may be entirely absent.

SCHLUTZ, Chicago.

STRIDOR OR MEDIASTINAL COUGH. GUILLERMO ARCE, Pediat. españ. **21**:20 (Jan.) 1932.

The author reports a series of six cases, all in infants under 1 year. Stridor and a chronic metallic cough were the principal symptoms. Physical signs in the chest were uniformly negative. The nutritional state was generally good. There were practically no general constitutional symptoms and practically no fever. The reaction of the skin and the roentgenogram confirmed the diagnosis of suspected enlargement of mediastinal glands due to tuberculous involvement, which doubtless in every case was the cause of the stridor and the chronic persistent metallic cough.

SCHLUTZ, Chicago.

REPORT OF FOUR CASES OF PULMONARY ABSCESS. MIGUEL FABRES, IVAN PRIETO N. and G. VALENZUELA L., Rev. chilena de pediat. **2**:273 (June) 1931.

Two of the cases occurred in children aged 2 years, one in an infant of 11 months and one in a child of 12 years. In two, of infants, the abscess was primary and cleared up spontaneously. In the infant aged 11 months the abscess followed a bronchopneumonia complicated by a septicemia. Surgical intervention was not possible, on account of the grave condition of the infant. The abscess was evacuated by puncture. The case terminated fatally. In the older child the abscess was a sequel of a tuberculous infection.

The author believes that pulmonary abscess in the child is not so rare a condition as is generally believed. In the infant the simple form predominates. It commonly complicates bronchopneumonia. It is often difficult to differentiate the abscess from an interlobular pleurisy.

The diagnosis is most certainly established by the roentgenogram. There is considerable tendency to spontaneous cure in a large number of cases. Surgical treatment has limited application.

SCHLUTZ, Chicago.

HYPERCHROMIC ANEMIA IN CHRONIC PANCREATIC DISEASE. H. BRUGSCH, Deutsches Arch. f. klin. Med. **173**:199 (June 27) 1932.

On the basis of reports in the literature, in addition to two cases from his own experience, Brugsch concludes that anemia, frequently with increased color index and with increased blood regeneration, may develop in severe, chronic pancreatic

disturbances with disordered external secretion of the pancreas. The clinical picture closely resembles that of pernicious anemia. True pernicious anemia also may follow such pancreatic disturbance and may even be the result of it. By means of special methods of examination, slight functional disturbances of the pancreas are more often demonstrable in pernicious anemia than was formerly supposed. The pathologicoanatomic aspects, however, are usually not characteristic.

DOOLEY, Kent, Conn.

ATRIOVENTRICULAR AUTOMATISM IN RHEUMATIC CARDITIS. I. OETTINGER and W. NESLIN, Deutsches Arch. f. klin. Med. **173**:212 (June 27) 1932.

In rheumatic carditis, an atrioventricular dissociation (nodal rhythm, type II) not infrequently arises and persists for a short time, from one to five or six days. It is not dependent on therapy with digitalis. This type II rhythm may arise in consequence of an increase in the irritability of the Tawara node or in connection with the checking of the automatic function of the sinus node. During a single observation, the nodal rhythm exhibits a high degree of constancy, whereas the sinus rhythm fluctuates in frequency. In cases of arrhythmia of the sinus type in which the maximum frequency exceeds that of the nodal rhythm, there is a more or less frequent shifting of atrioventricular dissociation and sinus rhythms. The former is very labile, as evidenced during slight effort or as a result of the injection of small amounts of atropine. Changing strength of heart beats with occasional so-called "cannon shot" sounds, and occasional premature beats without compensatory pauses or any relationship to the "cannon shot" sounds, together with unusual lability, suggest the diagnosis even before electrocardiograms are taken. In reaching these conclusions, the authors report fourteen cases.

DOOLEY, Kent, Conn.

RHEUMATIC FEVER, CHOREA MINOR AND ENDOCARDITIS. ERICH HÄSSLER and LOTTE MÖLLER, Jahrb. f. Kinderh. **136**:257 (Sept.) 1932.

This report is based on 256 cases from the Leipzig Kinderklinik, from 1923 to 1930; 246 of the patients were reexamined. The authors believe that the sedimentation test is of the greatest value in judging the activity of the infection. The constitution of the patient and dampness of his dwelling played no rôle in the etiology of these cases. Heart disease is liable to be fatal if not preceded by arthritis. Children who survive the first two years of their illness are likely to live. Rheumatic nodules were seen in 16 cases. No specific rheumatic pulmonary consolidation was observed. Poor results followed tonsillectomy. Vaccine was of little value in arthritis. Patients with chorea who were treated with phenyl-ethyl-hydantoin are likely to suffer relapses. American and English writings are ignored.

CLAUSEN, Rochester, N. Y.

TREATMENT OF THROMBOPENIC PURPURA BY ROENTGEN IRRADIATION OF THE SPLEEN. HERBERT HIPPE and RUDOLF KOCHMANN, Jahrb. f. Kinderh. **136**: 302 (Sept.) 1932.

In seven cases of acute thrombopenic purpura the patients were apparently relieved of bleeding by roentgen treatment of the spleen. The number of platelets rose to normal. The patients were not reexamined after long periods.

CLAUSEN, Rochester, N. Y.

SUGAR TREATMENT OF PYURIA IN CHILDREN. E. J. SCHMITZ, Jahrb. f. Kinderh. **136**:329 (Sept.) 1932.

Schmitz recommends the daily use of from 1,000 to 1,500 cc. of 15 per cent solution of sugar for one or two days, essentially the method of Aron (*Deutsche med. Wchnschr.* **51**:1477 [Sept. 4] 1925; *Monatschr. f. Kinderh.*, 1928, vol. 43).

CLAUSEN, Rochester, N. Y.

SYMPTOMS AND TREATMENT OF LIPOID NEPHROSIS. E. SCHIFF, Jahrb. f. Kinderh. **137**:1 (Oct.) 1932.

The author describes as complications of lipoid nephrosis: sudden attacks of abdominal pain, lasting from one to two days, accompanied by fever and leukocytosis; erythema, especially of the thighs, liable to be mistaken for erysipelas, and attacks of localized painful swelling, usually of the thighs. The aim of treatment is the relief of the tendency toward edema (*Oedembereitschaft*), as shown by the Aldrich-McClure test (not so-called by Schiff). This tendency, Schiff believes, is not wholly explained by changes in the plasma protein. He considers that the hyperlipoidemia is an indication for a diet high in lipoids. For relief of edema, Schiff finds the purine diuretics, thyroid, calcium chloride, ammonium chloride and ammonium nitrate unsatisfactory, sugar-days useless and mercurial diuretics dangerous. Urea, in doses over from 30 to 60 Gm., is usually effective; but a diet of raw fruit and vegetables for two or three days is almost always most effective. Thereafter, the yolks of five eggs, and from 60 to 100 cc. of orange juice a day are added; finally, from 80 to 200 Gm. of meat, especially liver, is added. Extra water is not demanded by the patients. Milk is not mentioned. Schiff believes that his diet is helpful in supplying biologically valuable lipoids and vitamins, rather than protein. If an infection is found, treatment is given. Sinusitis was rare in his cases. Eight of nine patients were relieved. Relapses of edema during infection were uncommon, and the subcutaneous fat was well preserved.

CLAUSEN, Rochester, N. Y.

STOMATITIS. HERMANN ZISCHINSKY, Jahrb. f. Kinderh. **137**:30 (Oct.) 1932.

Because textbooks fail adequately to describe many forms of stomatitis frequently seen, Zischinsky has attempted to classify, in a wholly preliminary way, 172 cases observed in the contagious service of Pospischill at Vienna as follows: 1. Simple gingivitis, 5 cases. 2. Ulcerative stomatitis, 2 cases. 3. Aphthous stomatitis, 30 cases: marked general symptoms; typical eruption; frequently associated paronychia; contagious; marked local symptoms; liable to secondary infection, which greatly complicates correct diagnosis (3 cases); larynx may be involved. 4. Aphthoid of Pospischill, 18 cases: on buccal mucosa and tongue; rarely on hard palate, tonsils or skin of lips; begins as a vesicle, the size of a lentil, with thick walls, a red base; umbilicated; soon ruptures; consistency very firm, like cartilage; margins vesicular, irregular and spreading; few general symptoms; almost painless; heals without traces; usually occurs in very ill patients, especially in scarlet fever; rarely affects larynx. 5. Membranous plaques, 9 cases: on cheeks and lips; membrane more tenacious than the diphtheritic. 6. Ulceration of the buccal mucosa, opposite the line of closure of the teeth, 16 cases: definitely not due to trauma. 7. Forms resembling aphthous stomatitis, 26 cases: no general and very slight local symptoms. 8. Nonspecific aphthoid, 32 cases: moderate fever; especially on tongue, spreading to buccal mucosa; begins as vesicules or white papules, giving rise to shallow ill defined confluent ulcers, not hard, very indolent, nearly painless; may appear on face. 9. Small shallow ulcers of the mucous membrane at the juncture of the upper and lower jaws, 1 case. 10. Silvery gray, glistening, concrete membrane, resembling mother of pearl, on the gums near the teeth, 6 cases: brief duration. 11. Group of red macules, surrounding swollen follicles, on the soft palate only, 4 cases: condition begins with high fever; disappears rapidly. Only in ulcerative stomatitis were any characteristic microscopic observations made.

CLAUSEN, Rochester, N. Y.

THE CIRCULATORY SYSTEM AND THE BLOOD VOLUME IN DISEASES OF CHILDREN: III. ORTHOSTATIC VASONEUROSIS OF OLDER CHILDREN. H. SECKEL, Jahrb. f. Kinderh. **137**:51 (Oct.) 1932.

In twenty-eight children, not confined to bed, aged 7½ to 15½ years, the following tests were made in the lying and in erect posture: (*a*) clinical symptoms;

(*b*) arterial blood pressure; (*c*) red cell count; (*d*) blood volume, by a dye method; (*e*) four hour water test; (*f*) tests for albuminuria. Variations on repeated testing fell within the limits of error of the method. In eight normally developed children, a normal orthostatic reaction was found; that is, no clinical symptoms appeared when the subject stood upright for from twenty to thirty minutes, the blood pressure sank less than 10 mm.; the plasma volume diminished 8 per cent or less, and mild albuminuria appeared only once. In twenty-one children, an abnormal reaction occurred. After standing from five to fifteen minutes, fatigue, collapse, fainting and, rarely, epileptoid seizures occurred. The blood pressure fell; the legs became congested and cold, the plasma volume sank from 10 to 27 per cent; orthostatic retention of fluids occurred, and albuminuria developed in nine. These children for the most part were disproportionately grown, hypotonic and pseudo-anemic, and had many complaints. Diathermy to one or both kidneys may reduce the albuminuria to a trace. The abnormal orthostatic circulatory reaction depends on faulty distribution of blood, with stasis in the legs and abdomen. This indicates the treatment.

CLAUSEN, Rochester, N. Y.

TRANSIENT CALCINOSIS UNIVERSALIS. H. JACOBOWITZ, Ztschr. f. Kinderh. **53**: 597 (Oct.) 1932.

The author describes a case of universal calcification of the soft tissues in a girl 4 years of age. The developmental history was entirely normal. She walked at 1¼ years. At 2 years she refused to walk and began to crawl. Two months before hospitalization, hard masses were felt in the soft tissues of the extremities, especially the knees. Roentgenograms showed that these masses contained calcium. Two months on a ketogenic diet and three weeks on sodium phosphate brought no relief; the masses became larger. After five months of hospitalization, fever and a rash developed, which was thought to be erysipelas. After fourteen days the rash disappeared, but the areas over the calcic deposits became abscessed and excreted bits of calcium. The process continued for over three months, after which the abscesses healed and the calcic deposits disappeared.

SHELLING, Baltimore.

ROENTGEN OBSERVATION OF HYPERTROPHIC PYLORIC STENOSIS. E. A. VOSS, Ztschr. f. Kinderh. **53**: 650 (Oct.) 1932.

The cardinal roentgenographic signs of hypertrophic pyloric stenosis are a sharp demarcation of the contrast shadow in front of the pylorus and elongation and narrowing of the pyloric canal.

SHELLING, Baltimore.

Nervous Diseases

EMOTIONAL DISTURBANCES AMONG CHILDREN. ELLEN B. SULLIVAN, J. Juvenile Research **16**:56 (Jan.) 1932.

Since emotional disturbances in children are often the result of complex environmental factors—social, educational or physical—it is often necessary (and often forgotten) to modify these external forces before trying to change the child. Sometimes doing nothing is the best form of treatment, especially when any sort of action focuses the child's attention on a disgrace or humiliation which he ought to forget. Often the adult companions, especially parents and teachers, will repeatedly emphasize these errors and perpetuate the attitude of inferiority. Manifestly these adult points of view must be changed before any progress can be made.

DAVIDSON, Newark, N. J. [ARCH. NEUROL. & PSYCHIAT.]

JUVENILE CRIME. ALBERT BECKHAM, J. Juvenile Research **16**:66 (Jan.) 1932.

The causes of crime among children are few but complex. The first is the plasticity of the growing organism, rendering the child unduly susceptible to

influence, whether good or bad; the second is social pressure which in congested districts is often responsible for the formation of gangs; other factors are defective domestic discipline with the resulting failure of "psychologic weaning," misdirected efforts at self-support (responsible for many cases of begging and stealing), chaotic efforts at mating, poverty and in some cases feeblemindedness or psychopathic personality. The latter defects, although not the principal causes of delinquency, are important because of the relative incorrigibility of the offender of this type. The solution to the problem is the deep, intelligent understanding of the child's personality development as well as of his behavior in regard to group relationships. DAVIDSON, Newark, N. J. [ARCH. NEUROL. & PSYCHIAT.]

BEHAVIOR DIFFICULTIES THAT BAFFLE TEACHERS. VIRGIL E. DICKSON, J. Juvenile Research **16**:93 (April) 1932.

In classifying their problems of discipline according to gravity, teachers are inclined to emphasize as serious those which interfere with the pedagogic routine, such as whispering, disobedience and meddlesomeness. They attach little significance to such abnormalities as shyness, fear or day-dreaming. Mental hygienists, on the other hand, reverse this order, considering that those problems which cause most trouble to the teachers are evidences of a strengthening personality trying to express itself. The traits, such as cruelty, sensitiveness and shyness, which cause little trouble in school, are considered more serious by psychiatrists and psychologists. In a statistical study, Dickson finds that misbehavior is commoner among boys and is found at all ages and in all grades, with a central tendency in the fifth grade and at the age of 11, and that these problems are unrelated to intelligence but are to a great extent associated with physical difficulties. Most common of these is endocrinopathy. In practically all cases, there was misunderstanding or mismanagement at home. The teacher should be trained to recognize these problems as well as to evaluate them. The more serious cases should be referred to a psychiatrist. Unfortunately, the author does not tell the psychiatrist what to do with these children.

DAVIDSON, Newark, N. J. [ARCH. NEUROL. & PSYCHIAT.]

AN ANALYTICAL STUDY OF VARIOUS FACTORS RELATING TO JUVENILE CRIME. EDWARD RUGGLES, J. Juvenile Research **16**:125 (April) 1932.

In order to determine the factors relating to juvenile crime, Ruggles has studied the records of 103 inmates of a North Carolina juvenile prison farm. He finds that, age for age, they are below average both in abstract intelligence and in mechanical aptitude. The boys who did achieve high scores in the latter were the boys who committed crimes (such as stealing or tampering with an automobile) which required a mechanical intelligence. Boys guilty of sodomy, rape and seduction generally had inferior intelligence even for the boys on the farm, while those arrested for bigamy tended to have higher scores. In almost every case a broken or unhappy home was found.

DAVIDSON, Newark, N. J. [ARCH. NEUROL. & PSYCHIAT.]

EDUCATIONAL ACHIEVEMENT OF DELINQUENT BOYS. VERA CHASE, J. Juvenile Research **16**:189 (July) 1932.

Chase studied the scores of 165 boys at a California school for delinquent children, using the new Stanford achievement tests. She found that in all subjects these children were inferior to public school children, but that their highest ratings were in reading and geography. In the latter subject their progress in school from grade to grade approximated normal, probably because it was a source of interest to them. The lowest scores were made in arithmetic.

DAVIDSON, Newark, N. J. [ARCH. NEUROL. & PSYCHIAT.]

THE TRANSIENT CHILD. MAY V. SEAGOE, J. Juvenile Research **16**:251 (July) 1932.

Frequent complaints on the part of principals and teachers that much of the disciplinary trouble in schools is due to the misbehavior of the transient children (that is, those not permanent residents of the districts) led Seagoe to study the behavior of this group in a statistical manner. She found that the comparison of data from schools between years is open to question because of the changing personnel represented by this transient class. Over 20 per cent of the children in the school districts that she studied could be classified as transients. Pupils in this group tended to be retarded in achievement, although they were generally normal in intelligence. Contrary to the popular opinion in pedagogic circles, these children did not commit more delinquencies than the permanent group; indeed, only 8 per cent of the offenses could be blamed on the temporary pupils, who constituted 22 per cent of the school census. When the offenses are grouped according to seriousness, however, a difference is marked. Of the delinquencies committed by the permanent pupils, 11 per cent were major, whereas 32 per cent of the offenses in the transient group could be so classified. It becomes apparent, therefore, that while transient pupils do not commit more delinquencies than their colleagues, they do engage in more serious ones.

DAVIDSON, Newark, N. J. [ARCH. NEUROL. & PSYCHIAT.]

ACUTE EPIDEMIC ENCEPHALITIS. F. P. CURRIER and D. B. DAVIS, J. Michigan M. Soc. **31**:437 (July) 1932.

The authors studied twenty-six cases seen since 1927. Fourteen of them occurred in the year 1930. In the months of November, December, January and February there were the least number of cases. Only six cases were preceded by symptoms of a condition of the upper respiratory tract. The ages ranged from 2 to 61 years, averaging 24. The period of acute illness averaged thirty-four days. Lethargy occurred in 64 per cent of the cases, and the frequencies of headache and myoclonus were about as high. Disturbances of speech and ocular conditions were not frequent. In only one case were there fundus changes, a hemorrhagic retinitis, which cleared completely; there were also sensory changes (hyperesthesia) in only one case.

Observations on the spinal fluid were interesting in that in many cases they were practically normal. In all of them the cell count was slightly increased, averaging 44 cells, usually lymphocytes. The sugar content was 67 mg. on the average, although simultaneous observations on the blood sugar are not given. The chlorides averaged 652 mg. While no facts are given as to the outcome of the disease with the patient under treatment, the authors believe that rest, iodides and salicylates, and foreign protein therapy are worth attempting in the acute phases, and hyoscine and stramonium later.

SMITH, Ann Arbor, Mich.

PEDIATRIC PSYCHOLOGY AND THE CHILD GUIDANCE MOVEMENT. JOSEPH BRENNEMANN, J. Pediat. **2**:1 (Jan.) 1933.

Dr. Brennemann presents the pediatrician's point of view and reaction to the current widespread interest in child psychology and psychiatry. The complexity of the child's life, the excessive stimulation from all sides and the restrictions necessarily imposed on children in the cities are described as factors producing many of the problems of child behavior in modern times. The child's environment places numerous limitations on his activities, and the resentment of the child at these interferences is not surprising. The confusion and unnecessary complexity of methods of infant feeding of twenty-five years ago are compared to the present state of uncertainty and misunderstanding so generally found in connection with child behavior. The circulation of unsatisfactory popular literature on child psychology has caused the bewilderment of parents and has done

much more harm than good. Taking the child to the psychiatrist may in itself produce injurious results by focusing attention on this aspect. If the pediatrician makes use of the knowledge that psychiatry has to offer, he is in the best position not only to correct, but also to forestall the occurrence of many of the mental conflicts of the child's life. The facts produced by scientific investigation must be adapted and applied in a practical way by one who is in a position to judge the child as an individuality. In time, better cooperation will undoubtedly exist between all persons interested in these problems, and more effective practical methods for their solution will evolve.

LeMaster, Evanston, Ill.

What is Dementia Praecox? Esther L. Richards, J. Pediat. **2**:46 (Jan.) 1933.

To obtain the best results in the treatment of dementia praecox, it must be recognized early. The childhood types of personality suggesting a tendency to schizophrenia are classified by the author as follows: (1) the apathetic, pepless, absent-minded, day-dreaming or "backward" child; (2) the bookish, serious-minded, docile, prudish child whose precocity seems unbalanced by any social assets and play interests; (3) the whining, "neurotic," aggressively egocentric child with violent outbursts of temper, motivated by unintelligent negativism, and (4) the Peter Pan type of child, who on growing into adolescence and youth remains emotionally immature. The first step is recognition of environment which the personality has to deal with, so that instead of featuring such a child as a model of conduct, effort should be made to socialize the behavior. The next step is to study ways and means of bringing about this socialization. Patience, common sense and intelligence are required to discover how these children can be baited into playing and mingling with other children of their age. The physician is in a strategic place to initiate team-work between parents, teachers and friends in combating the reaction of dementia praecox at an early stage.

LeMaster, Evanston, Ill.

Ganglioneuroma of the Cervical Sympathetic in a Child. Hans Bischoff, Arch. f. Kinderh. **93**:140 (April 10) 1931.

A boy of 4 years was brought to the clinic because of dyspnea and stridor. The roentgenogram of the chest showed a well defined, dense mass in the upper part of the left pulmonary field, pushing the trachea to the right. After a period of observation the mass was removed by operation and proved to be a ganglioneuroma of the cervical sympathetic nerve. A Horner syndrome followed the operation. The importance of roentgen examination of the chest in cases of unexplained respiratory stridor is illustrated by this case.

LeMaster, Evanston, Ill.

Changes in the Leukocytes During Phenyl-Ethyl-Hydantoin Therapy in Children with Chorea. Eugenio Schwarz, Arch. f. Kinderh. **94**:1 (July 17) 1931.

Nine children with chorea were treated with 0.3 Gm. (5 grains) of phenyl-ethyl-hydantoin daily. A typical rash developed in six patients, and an elevation of temperature in four. The total white blood cell count was slightly diminished during the first few days of treatment. A rapid drop in the leukocyte count occurred just before the rash appeared, followed by a rise above normal after the rash had fully developed. An increase in eosinophils and large mononuclear cells was observed during the exanthem. Improvement in the symptoms of chorea was much more marked in those patients who responded to the treatment by rash and fever. The author compares the phenyl-ethyl-hydantoin reaction to serum sickness.

LeMaster, Evanston, Ill.

THE PROGNOSIS OF CHILDHOOD EPILEPSY. JULIUS ZAPPERT, Kinderärztl. Praxis **4**:161 (April) 1932.

The optimistic note in recent pediatric literature regarding the frequency of permanent cure of epilepsy in childhood is not concurred in by Zappert. A careful history of a large number of cases of true epilepsy, as well as the results of following individual cases of infantile and childhood convulsions into later life, makes it probable that the onset of many cases of epilepsy is camouflaged by seemingly harmless convulsions, apparently due to other causes. If in addition to this, in judging the prognosis of epilepsy, one throws out of consideration diseases with attacks resembling epilepsy but which are not truly epileptic, the cases in which epilepsy is truly and permanently cured are few. Zappert says that no exact figures can be given.

HUENEKENS, Minneapolis.

CHILD PSYCHOLOGY OF FREUD AND ADLER. P. SCHROEDER, Monatschr. f. Kinderh. **55**:81, 1932.

The author gives a brief discussion of the teachings of Freud and of Adler and cites several cases in which a knowledge of these teachings was of great service to him. While he is not ready to accept them as final, he believes that they are leading in the right direction.

GERSTLEY, Chicago.

CATALEPTIC SYMPTOMS IN A THREE AND A HALF YEAR OLD CHILD. JULIUS SURANYI, Wien. klin. Wchnschr. **45**:234 (Feb. 19) 1932.

The case of a 3½ year old girl is reported. She was the third child of apparently healthy parents and had two younger siblings. One of the siblings died following whooping cough when 5 years old. The others were healthy. The girl was severely asphyxiated when born and was treated with Schultze's method and with baths. The child was normal through infancy; she was weaned at 10 months, and the first teeth appeared at 10 months. The retardation of growth and speech was noticed at the age of 1½ years.

Examination showed a girl greatly retarded in development. The weight was 7.8 Kg.; the length of the body, 74 cm.; the circumference of the stomach, 48 cm., and the length of the foot, 10 cm.; the skin was light brown and could be raised on the face in heavy folds. The skull was symmetrical. The fontanels were closed. There were slender, thin bones, a slightly rachitic thorax and twenty normally developed, partly carious teeth. The mouth, throat and lungs were normal. The cardiac tones were pure; the diastolic pause was equal to the systolic. The frequency was 110. The pupils were symmetrical and reacted well to light and in accommodation. Movements of the eyes were normal. There was slight facial asymmetry, which might also be functional. The abdominal reflexes were normal. The musculature of the upper arms was well developed, as contrasted to the rest of the body. The musculature of the lower extremities did not show any atrophy; a bilateral slight muscle rigidity was observed in passive movements. There was a slight decrease in tonus. The right extremities were more active than the left. Most noticeable, especially in the lower extremities, was the strong catalepsy. The legs remained for a considerable time in the position into which the examiner put them. Only after from fifteen to twenty minutes were the legs lowered to a resting position. The same was observed for the arms, but in a slighter degree. The inability to stand and walk has been already pointed out. The child rejected violently any attempt to stand up. Active motility of the legs was lowered. The Babinski, Oppenheim and Rossolimo reflexes were absent. There were no tetanic reflexes. There were lively symmetrical patellar reflexes and no clonus. Adiadokinesis was normal. The pyramidal system was intact. During passive movement of one leg, the other leg did not change its position. There were no involuntary movements and no convulsions of any kind. As far as was possible

to determine, there were no disturbances of sensibility. The musculature of the trunk functioned well; the child could sit up alone. The intelligence did not correspond with the age, but was more advanced than the bodily development, which corresponded to that of a normal child 1 year old. The child talked, knew the names of different parts of the body and the names of the nurses; she tended to repeat what she heard; she expressed her wants, and her memory was good. Her disposition was friendly. The mental development corresponded to that of a 2 year old child. The temperature was irregular, sometimes reaching 39 C. (102.2 F.) without apparent cause.

Another girl of the same age with celiac disease presented an interesting comparison. This child was of a very unfriendly, sickly disposition. After six weeks both children gained more than 1 Kg. In the cataleptic child the gain was in the adipose tissue, while in the other the disproportion improved considerably. In spite of massage and walking exercises, the cataleptic child was unable to stand and walk, while the other began to stand up without help and to take her first steps. Still the superficial impression was that the child with celiac disease was really sick. All examinations, such as analysis of the urine and blood, and the Wassermann test, gave negative results. The basal metabolism could not be determined because of the restlessness of the child. Clinical symptoms, which could point out injury of the pituitary or thyroid gland or the suprarenals, were absent.

The case reported is one of catalepsy caused by an injury of the extrapyramidal system. The diagnosis is severe catalepsy of the lower extremities and mild catalepsy of the upper extremities. There is a possibility of developmental anomaly of the ganglions of the stem. Further possibilities are: asphyxia appearing at birth, bleeding caused by Schultze's treatment or an inflammatory process of the central nervous system.

ABT, Chicago.

THE PRESENT STATUS OF THE ENCEPHALITIS PROBLEM IN CHILDHOOD. J. ZAPPERT, Wien. klin. Wchnschr. **45**:737 (June 10) 1932.

The modern study of encephalitis in childhood was stimulated by a study of the numerous cases of epidemic encephalitis occurring in 1915. The author discusses the investigations of von Economo and other workers. He divides the encephalitis diseases of recent years into three groups: postvaccinal, postinfectious and primary or spontaneous.

Infants are relatively immune to postvaccinal encephalitis. The cause of this is not as yet clear. A possible cause would be that older children are more subject to vaccination en masse than the infants, and that they are, therefore, more exposed to contact infection. Infants vaccinated at home suffer less from encephalitis than those vaccinated in public health centers.

The clinical picture is familiar. Postencephalitic sequelae characteristic for epidemic encephalitis do not occur after postvaccinal encephalitis.

Postinfectious encephalitis may occur not only after severe infectious diseases, but even after slight ones, such as chickenpox, mumps, German measles, angina, typhoid fever and paratyphoid fever, dysentery and pneumonia. Symptoms are varied. Postmortem observations in encephalitis after measles are strikingly similar to those found after postvaccinal encephalitis.

Spontaneous encephalitis has also increased in frequency. Symptoms are varied; convulsive, toxic, meningitic, hemiplegic, diplegic and myelitic forms are included, as well as cases with Landry's paralysis, acute cerebral tremor and acute ataxia. Differentiation from poliomyelitis is difficult.

The author points out that the majority of cases of primary encephalitis resemble postvaccinal and postinfectious encephalitis, and that all three forms differ sharply from epidemic encephalitis. Whether the three forms are interrelated cannot be definitely stated as yet.

ABT, Chicago.

DIAGNOSIS OF OTOGENOUS MENINGITIS. G. ALEXANDER, Wien. klin. Wchnschr. **45**:788 (June 17) 1932.

A careful and objective observation is necessary for the early diagnosis of meningitis. It may be mistaken for otitis even by an experienced physician. One must regard with suspicion every case of suppurative inflammation of the middle ear in which the local cause is insufficient to account for such symptoms as continued fever, headache, insomnia, unrest and dyspnea. Spinal puncture is important for the differential diagnosis and therapy, especially in the early stages. If chronic disease of the brain (neoplasm, gumma, tubercle or encephalitis) is present, only a small amount of liquid should be taken when spinal puncture is performed, otherwise severe cerebral symptoms may occur.

In meningitis the protein content of the fluid is increased; in tuberculous meningitis, either decreased or negative, and in serous meningitis and in neoplasm, increased.

In otogenous meningitis the spinal fluid is normal, and in abscess of the brain, it is usually turbid and sterile.

ABT, Chicago.

CASES OF EPIDEMIC MENINGITIS SEROSA IN THE SUMMER OF 1931 IN SZEGED. L. BERKESY, Wien. klin. Wchnschr. **45**:879 (July 8) 1932.

Although according to the present state of experience, both clinical and experimental meningitis serosa are assumed to be aseptic, observations of several epidemics led the author to change the term to meningitis serosa epidemica.

In the summer of 1931, the author observed ten patients who became ill at almost the same time. All patients were of the male sex. One was 12 years old, while the age of the others varied between 17 and 24 years.

The onset of the disease was acute, with high fever and rapid development of characteristic symptoms of meningitis: severe malaise, often with a preceding angina, and frequent chills.

Leukocyte counts varied from 4,300 to 15,000; a constant marked shift to the right was present; mononuclear cells were either decreased or increased; eosinophils disappeared except in three cases. Albuminuria was present in one case.

Examination of the spinal fluid showed that pressure was increased in all cases. In one case the liquid was turbid. The globulin reaction was never marked; in one case, it was unchanged. The number of cells varied from a high normal to 700 and consisted of lymphocytes. Fibrin coagulation was observed in only the cases in which the cell count was 700. Bacteria were absent in all cases.

All of the patients recovered after from seven to fourteen days.

ABT, Chicago.

VOLUNTARY REFUSAL OF CHILDREN TO TALK. HANS HEINZE, Ztschr. f. Kinderforsch. **40**:235 (Aug. 19) 1932.

This type of child must be distinguished from the deaf and dumb, the idiotic and the aphasic child. This is not possible at the first examination. It will require a careful observation and a tactful exploration to remove the barrier between physician and patient. It is particularly important to study the past life, experience and environment of the child. Usually these children are the victims of their feeling of insufficiency; they lack the normal amount of egotism which most children possess; they are easily embarrassed, and their silence is a form of protection.

REICHLE, Cleveland.

Diseases of the Ear, Nose and Throat

THE CLINICAL IMPORTANCE OF THE MASTOID ANTRUM. G. EDWARD TREMBLE, Arch. Otolaryng. **15**:574 (April) 1932.

A detailed anatomic description of the temporal bone as related to the mastoid is given for infants, for older children and for adults, with comparisons of these

stages of development as they merge one into the other. These variations make a great deal of difference in operative procedures in locating the structures at different ages.

BARNETT, Chicago.

PATHOLOGIC CHANGES IN THE TONSILS: THEIR RELATION TO THE USUAL INDICATIONS FOR TONSILLECTOMY. PAUL S. RHOADS, Arch. Otolaryng. **15**:599 (April) 1932.

There is wide divergence of opinion as to the advisability of tonsillectomy, but local examination is the deciding factor in the majority of cases. There may be gross evidence of a pathologic condition in the tonsil itself, glandular enlargement or systemic symptoms of focal infection for which tonsillectomy may be advised as a part of the general program for cleaning up pathologic foci.

Qualitatively, little difference has been found in the bacterial flora of the different pathologic types of tonsils, but quantitatively they vary considerably.

The chronic hyperplastic tonsil has most often considerable hyperplasia of the lymph follicles, being often associated with lacunar tonsillitis and little ulceration of the crypts. It is usually found in children of school age, and is associated with colds, breathing through the mouth and otitis media, the latter two being obstructive symptoms.

Chronic lacunar or chronic ulcerative tonsillitis shows loss of the epithelium of the deeper crypts and thickening of the epithelium nearest the surface. Ulceration of the walls of the crypts is common, and the crypts are often filled with tissue and food débris. These changes are usually in the small or average sized tonsils that cause a "raw" throat.

The chronic fibrous tonsils are the most often removed as the cause of focal infection and symptoms of arthritis, etc., in other locations. They contain the highest bacterial counts per gram of all the whole tonsils. Chronic lacunar tonsillitis forms a part of their pathologic picture, but there are also interstitial fibrosis and increase of fibrous tissue in the trabeculae and capsule. Cartilage and bone are not uncommonly found near the capsule. It was found in one series that 80 per cent of such tonsils were removed because of arthritis and rheumatic heart, 10 per cent because of hyperthyroidism and 10 per cent because of frequent colds.

Tonsil stumps from previous operations contain more bacteria per gram than any of the other forms of whole tonsils mentioned. Several patients that did not show improvement in the systemic trouble following the original tonsillectomy did so readily after the removal of infected stumps.

Peritonsillitis is not often mentioned, but is usually present with the badly infected tonsil, especially the chronic fibrous type.

Small abscesses and tuberculosis were found in a few cases.

BARNETT, Chicago.

MENINGEAL LESIONS COMPLICATING AURAL INFECTIONS. M. R. MOBLEY and J. P. PRICE, J. South Carolina M. A. **29**:4 (Jan.) 1933.

They divide meningitis into four groups: (1) serous, (2) lymphocytic, (3) polymorphonuclear or purulent meningitis and (4) meningism. Only three of the four types are found in meningitis from an otitic origin, and, in order of frequency, the purulent type, the serous type and, in rare cases, meningism are found. In some cases in which patients show purulent meningitis, repeated cultures are sterile.

The symptoms are nausea, headache and slight stiffness of the neck, accompanied by a slight rise in fever and an increase in the number of leukocytes in the blood. The signs may vary from slight to severe. As long as the condition is localized it is curable, and the only treatment is surgical, which consists of mastoidectomy. To offer proper drainage, repeated lumbar punctures are advised. Two cases in which treatment was successful were observed by the authors.

ORSTON, JR., Columbia, S. C.

MEDICAL ASPECTS OF SPEECH DISORDERS. JOHN GLASSBURG, M. J. & Rec. **136**:376 (Nov. 2) 1932.

Disorders of speech are pathologic conditions and require medical treatment. Two types are recognized: stuttering or stammering, and defective phonation. Stuttering is a spastic coordination neurosis based on a mental conflict, and the causes are a predisposing neuropathic constitution, an exciting psychic result and an aggravating pathologic process in the ear, nose, throat or mouth. The treatment is medical, surgical, psychotherapeutic and reeducational. The etiology of defective phonation is central and peripheral. The cerebral causes are mental deficiency, hydrocephalus, amaurotic family idiocy, hereditary ataxia, cerebral hemorrhage, spastic spinal disease, multiple sclerosis, paresis, Bell's palsy, injuries and tumors of the brain, epilepsy, chorea major and eunuchoidism. The peripheral causes are abnormalities of the tongue, throat, mouth, lips, nose and larynx, pressure on the trachea, recurrent laryngeal nerve and vagus and postdiphtheritic paralysis. There are various kinds of aphasia, such as motor, auditory and visual aphasia. Hoarseness, falsetto voice and retarded development of speech are forms of defective phonation requiring medical care.

WILLIAMSON, New Orleans.

SERIOUS DISTURBANCES PRODUCED BY LATENT OTITIS AND MASTOIDITIS IN THE INFANT: DIAGNOSIS AND EARLY TREATMENT. I. OREVICEANU, I. HEROVICI and W. GRUNBERG, Bull. Soc. de pédiat. de Paris **30**:425 (April 2) 1932.

There are two forms of latent otitis and mastoiditis in infants: (1) acute, in which diarrhea, vomiting, dehydration and toxemia are present, and (2) subacute, in which the development is slower, the infant shows progressive loss of weight, and digestive, pulmonary or other symptoms predominate. In all of these cases the ear acts as the primary focus of infection, from which bacteria get into the blood stream; the bacteria may lodge in another part of the body, producing the complications. Early paracentesis is of the utmost importance in the treatment in such cases, and if repeated paracenteses are not followed by decided improvement, mastoid antrotomy should be performed. There was a characteristic differential blood count in the infants with latent otitis and mastoiditis, which consisted of a marked decrease in the monocytes and an increase in the number of young neutrophils, with some promyelocytes.

BENJAMIN, Montreal, Canada.

LATENT OTITIS CAUSED BY HOFFMANN'S BACILLUS IN AN INFANT. A. RUSESCO and E. DARABAN, Bull. Soc. de pédiat. de Paris **30**:431 (May 14) 1932.

Diphtheroid bacilli are usually considered as saprophytic organisms. In this case, that of an infant, 8 months old, diphtheroid bacilli were present in smears of the pus obtained by paracentesis of the membrane of the drum, and cultures of the pus produced a pure growth of the same bacilli. Drainage from the ear continued for about fifteen days after the incision was made.

BENJAMIN, Montreal, Canada.

THE TREATMENT OF MASTOIDITIS. RUDOLF LEIDLER, Jahrb. f. Kinderh. **137**:350 (Dec.) 1932.

An otologist crosses swords with Zischinsky (*Jahrb. f. Kinderh.* **136**:310, 1932) regarding the expectant treatment of mastoiditis. In particular, he points out that such methods are liable to result in deafness.

CLAUSEN, Rochester, N. Y.

GLANDULAR FEVER AFTER TONSILLITIS CURED BY TONSILLECTOMY. STELLA MÜNZ, Monatschr. f. Ohrenh. **66**:1108 (Sept.) 1932.

Münz reports the case of a child, aged 7, with an acute disease of the mucosa of the nasopharynx and throat of about six weeks' duration, with simultaneous severe, painful swelling of all the cervical glands. The course of the disease was

marked by repeated rise and fall of the fever, glandular swelling and a transitory attack of polyarthritis. The swelling of the glands always increased with an exacerbation of the disease of the mucosa. They remained enlarged till the end without abscess formation. There were no demonstrable changes in the other glands, spleen or liver. After tonsillectomy and adenotomy, performed during a remission of acute symptoms, there was a recurrence of fever and swelling lasting two days, followed by recovery. Münz thinks that this might be considered as a lymphatic reaction in acute disease of the adenoid tissue of the tonsillar ring with a tendency toward remissions. She thinks it important to emphasize this relation, as the new conception of this clinical picture, especially Lehndorff's, assumes an idiopathic (usually generalized) swelling of the lymph glands, of unknown etiology, with an accidental secondary infection of the adenoid tissue. In cases in which the relation between remittant glandular swelling and disease of the adenoid tissue is evident, extirpation of the adenoid tissue should be undertaken at an opportune moment.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

ARTERIES OF THE PALATINE TONSIL. H. BRUNNER and J. SCHNIERER, Monatschr. f. Ohrenh. **66**:1180 (Oct.) 1932.

Brunner and Schnierer studied the arterial supply of the tonsils at necropsy in six specimens and found a much greater variation than was found by Lund in his examination of twenty specimens. They agree with the latter that the arteries usually pierce the superior pharyngeal constrictor at the level of the lower pole of the tonsil and enter the capsule at this level, but contrary to Lund's observations, they also found arteries in the upper pole of the tonsils in cases in which the tonsils were supplied by several arterial branches. In the new-born they found that the arterial branch pierces the constrictor and penetrates through the capsule into the tonsil from the side. The arteries may traverse the parenchyma and ramify on the medial surface of the tonsil, thereby penetrating into the fold of mucous membrane which covers the supratonsillar fossa. In adults they found the capsule artery, described by Lund, only once, and even in this case there was another artery which appeared under the tonsil and extended to the front to supply the inferior pole of the tonsil and the anterior palatine arch. In the other two cases the arterial branches tended to encircle the tonsil and then penetrate the parenchyma from the front or the back, also supplying, respectively, the anterior or the posterior palatine arch. So far as the derivation of the arterial arteries is concerned they found that in two cases (in a fetus and in a new-born infant) the tonsil was supplied by the ascending palatine artery which originates in the external maxillary artery; in two cases by the ascending palatine and the external carotid, and in one case by two branches of the external maxillary artery as well as the external carotid. The authors agree with Lund that the most important vessels are in the lower pole of the tonsil, and that arterial hemorrhage is most to be feared in this region. They consider it surprising that postoperative arterial hemorrhages are not more frequent under these variable conditions. They attribute the postoperative closing of the tonsillar arteries to their strong annular musculature and the intima cushions of the tonsillar arteries, described by Brunner.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

INFLUENZAL OTITIS. E. V. GYÖRGY, Wien. klin. Wchnschr. **45**:818 (June 25) 1932.

E. V. György records four illustrative cases in infants aged from 2 to 13 months, and distinguishes the following four forms of influenzal otitis: (1) the hyperacute toxic form, characterized by a sudden severe onset with rise of temperature to 104 F., vomiting, diarrhea, rapid developed of suppurative otitis and subperiosteal abscess, followed by death in a few days in spite of paracentesis and antrotomy; (2) an acute form in which the course is not so rapid and treatment is usually successful; (3) a subacute form; (4) a protracted form. In the acute

cases the aural symptoms dominate the clinical picture, and are accompanied by catarrhal involvement of the nasopharynx and lungs. In the subacute cases the catarrhal symptoms predominate, and the otitis is less prominent.

A. F. ABT, Chicago.

MODERN OPINIONS ON STAMMERING. HINKO FREUND, Ztschr. f. Kinderforsch. **40**:264 (Aug. 19) 1932.

This article is a discussion of the theories on the development of stammering from the author Mercurialis of the sixteenth century down to the latest opinions.

REICHLE, Cleveland.

SEPTICEMIA FOLLOWING TONSILLITIS. W. UFFENORDE, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **23**:41 (Sept.) 1932.

Uffenorde discusses the hematogenous, lymphogenous and phlegmonous forms of pathogenesis of septicemia following tonsillitis. He thinks that the phlegmonous origin is most common. In this form of pathogenesis the infection originating in the tonsils is spread by a progressive phlegmonous process in the interstitial spaces of the neck, which extends into the parapharyngeal space and sometimes to the exterior. The process may extend to the cerebrum and also, but more rarely, to the mediastinum. Periphlebitis in one or several places, near or far from the primary focus, leads to phlebitis and thrombophlebitis. The author thinks that thrombosis of the smallest veins in the tonsillar region has no rôle in the pathogenesis of septicemia. It may be considered more as a protection against the spread of infection than as an endophlebitic septic focus. The various forms of pathogenesis frequently overlap each other. The author emphasizes that the tonsil may constitute the septic focus as well as the portal of entry of the infection. Diagnosis of septicemia is often difficult. Chills are sometimes lacking in septicemia, and, on the other hand, they sometimes mark the beginning of some other disease. Careful anamnesis and bacteriologic examination of the blood are valuable. Cytologic examination of the blood is important not only for differentiation from leukemia, agranulocytosis and tonsillitis with the lymphoid cell reaction, but also for control of the blood picture in dubious cases. If the tonsil is the main septic focus, enucleation suffices even if the peritonsillar tissue is also inflamed. In cases in which the spread is lymphogenous or phlegmonous, intervention should be from the exterior and should consist in the thorough airing and draining of all affected interstitial spaces and the parapharyngeal space up to the tonsil and a careful examination of the blood vessels, including the jugular vein and the facialis communis with its branches. Ligation of the jugular vein is not an absolute safeguard against spread of the infection. In case the veins are pathologically altered, the diseased part should be resected after ligation. Ligation of a healthy vein is useless. EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

SEPTICEMIA FOLLOWING TONSILLITIS. H. CLAUS, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **23**:58 (Sept.) 1932.

Claus discusses septicemia following tonsillitis, particularly in regard to diagnosis and therapy. After blood has been taken for bacteriologic and cytologic examinations, a careful anamnesis obtained and examination of the larynx and pharynx completed, the exterior of the neck should be carefully examined. Sensitivity to pressure in the angle of the jaw is significant if there are no acute manifestations in the tonsils. Cord formations are found in phlegmons and glandular infection and are not a septic symptom unless the blood vessels or the mediastinum is involved. Careful study of the general condition is valuable. Special examination of the lungs, heart and kidney to determine metastases and of the eyes for symptoms of cavernous sinus thrombosis should be made. Thrombophlebitis of the jugular vein toward the sigmoid sinus may occur. Exposure of the sinus and removal of the thrombus may save the life of the patient. The author thinks

that there is always a phlegmonous process in the loose connective tissue of the parapharyngeal space, which spreads to the near or distant lymph vessels or, more often, to the veins, and that the infection is never spread directly via the lymph or blood vessels. The phlegmon spreads toward the mediastinum more often than toward the cranial cavity. Surgical intervention for inspection of the large vessels should be undertaken whenever possible and should consist in an incision along the inner edge of the sternocleidomastoid muscle from the tip of the mastoid process to the clavicle. If the infiltration is severe and orientation is difficult, cervical mediastinotomy is indicated to find the veins; they may then be traced upward to the area of infiltration. Diseased vessels should be resected, whenever possible, following ligation. The healthy jugular vein should be ligated when the facial vein is diseased and in doubtful cases. Elimination of the actual septic focus is important. The author supplements control of the blood vessels with tonsillectomy, since a focus of suppuration is often found behind the normal appearing tonsil. Enucleation of an acutely inflamed tonsil need not be shunned if the interstitial spaces of the connective tissue have been previously exposed from the exterior and no injection is made into the infected area. Metastases in the lung are not a contraindication to intervention.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

TONSILLECTOMY IN INTERNAL DISEASES. J. HORÁK and L. POLEDUÁK, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **23**:135 (Sept.) 1932.

Horák and Poleduák discuss the results of tonsillectomy in internal disease on the basis of personal observations gathered since 1924. Tonsillectomy was usually performed after regression of the acute tonsillitis and the acute attack of internal disease, except in cases in which the acute attack lasted for weeks and months without exhibiting any tendency to improve. In cases of sepsis, endocarditis and nephritis tonsillectomy was undertaken as soon as a relation between the internal disease and the tonsillar disease was ascertained. In cases of chronic disease, tonsillectomy was performed at any stage during a subfebrile period. The best results were obtained in cases of articular rheumatism. Only a small percentage of patients were treated by tonsillectomy, but of those so treated, 75 per cent were cured, 23 per cent were improved, and only 2 per cent were not improved. In cases of heart disease the results were also good, but 13 per cent of the patients showed no improvement. Among the cases of renal disease in which tonsillectomy was performed, focal nephritis occurred most frequently and responded most favorably. Good results were also obtained in cases of sepsis of oral origin. Among the patients with neurologic disturbances who were treated by tonsillectomy, the best response was obtained in those with chorea minor. Comparison of the results obtained by tonsillectomy in internal diseases with those obtained by other forms of treatment shows the therapeutic value of tonsillectomy in internal diseases of a generally septic character. The authors list the contraindications. They point out that if the hematogenous spread of infectious material from the tonsils into the body has been going on a long time, tonsillectomy often cannot arrest the septic process in the body.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

BILATERAL MALFORMATIONS OF ORGANS OF HEARING. G. BRÜHL, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **23**:167 (Sept.) 1932.

Brühl thinks that bilateral microtia and atresia are not, as a rule, accompanied by anomalies of the inner ear which cause deafness. Among fifty-three cases of congenital atresia of the ear collected by Marx, only seven were bilateral, whereas the congenital anomalies of the labyrinth which result in deafness are usually bilateral. The auditory vesicles from which the labyrinth develops are early removed so far from the surface that external injuries cannot easily influence their course of development. The superficially located embryonic tissue of the sound-conducting apparatus is more exposed to such mechanical influences as pressure, strain, crushing, adhesion and anomalies of position which are determined by

chance and frequently affect only one side. That malformation of the pinna is usually accompanied by defects of the auditory meatus and the middle ear is explained by the common branchiogenous development of all these parts. There is rarely a partial malformation of the sound-receiving apparatus, and it should be especially emphasized that in persons with a normal pinna, malformations seemingly limited to the auditory meatus, such as stricture or atresia, are usually accompanied by malformation of the middle ear. For this reason surgical intervention in cases of microtia and atresia or in those of stricture and atresia of the external auditory meatus for improvement of hearing is usually useless; even if a wide meatus is constructed, the existing anomalies of the middle ear, tympanic membrane, auditory ossicles or tympanic fenestra will prevent a functional recovery. Four case reports are given in support of this opinion.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

DOUBLE MIDDLE TURBINATE. RUDOLPH MICHL, Časop. lék. česk. **70**:1472 (Oct. 30) 1931.

The author reports a case of complete duplication of the right middle turbinate bone. The question of embryology is discussed briefly. STULIK, Chicago.

Diseases of the Skin

HISTOLOGIC CHANGES IN ALLERGIC AND NONALLERGIC WHEALS. B. S. KLINE, M. B. COHEN and J. A. RUDOLPH, J. Allergy **3**:531 (Sept.) 1932.

A histologic study was made of thirty-one specimens of human skin from twenty-seven persons sensitive to ragweed pollen, dust, heat, cold or scratching, and from four persons not sensitive, but in whom injections of histamine were used. Sections of the skin were removed at intervals of from five minutes to twenty-two hours after the injection of a specific allergen or histamine or after exposure to heat, cold or scratching. One specimen was taken from each patient.

The inflammatory reaction beginning ten minutes after injection was much the same as an ordinary inflammatory reaction. Fifteen minutes after injection, 25 per cent of the wandering cells were eosinophils. This percentage gradually increased to an average of 59 in seven specimens studied at stages of from twenty-five to thirty minutes after injection; from this stage on the percentage of eosinophils decreased and the inflammatory reaction increased until the sixth hour, at which the stage of greatest inflammatory reaction was reached. At this time the percentage of monocytes was greatly increased, and that of eosinophils was decreased, although it was still slightly above normal. At twenty-two hours the percentage of cells was about the same as at six hours with, however, evidences of degenerative changes in the cells.

Histamine injected into allergic persons produced reactions scarcely distinguishable from those produced by the specific allergens. Histamine in nonallergic persons, or heat, cold or scratching in persons sensitive to these agents, produced only slightly inflammatory reaction. HOYER, Cincinnati.

POISON IVY: A NEW METHOD OF IMMUNIZATION; PRELIMINARY REPORT. FRED MAISEL, J. Allergy **4**:35 (Nov.) 1932.

The method was employed in the treatment of a man, aged 27, who had had poison ivy annually for ten years and who suffered from dermatitis throughout the year. Treatment by injections as a preventive measure and as a cure gave no relief. A patch test with tincture Rhus toxicodendron gave a positive reaction in twelve hours. Oral treatment with this tincture produced no improvement. Daily baths of five minutes' duration were then instituted. The initial dose was 1 drop of the tincture to 10 gallons (38 liters) of water. The dose was gradually increased over a period of twenty-six days to 450 drops for every 4 gallons

(15 liters) of water. This dose produced a generalized pruritus which lasted a week. The dose was reduced and again gradually increased to 450 drops for every 4 gallons, when pruritus again developed. The treatment was then discontinued. Exposure to poison ivy on different occasions produced no symptoms. The patch test produced only a slight reaction after twenty-four hours, which cleared up in thirty-six hours; this was in contrast to a reaction which, before the treatment with baths, developed in twelve hours and persisted for days. The case is reported in the hope that others will try the method and report their results.

HOYER, Cincinnati.

NAEVO-NEUROFIBROMATOSIS. REGINALD LIGHTWOOD, Proc. Roy. Soc. Med. **25**:1738 (Oct.) 1932.

A case of nevoneurofibromatosis was reported in a boy of 8 months. The skin of the abdomen, back and buttocks was deeply pigmented and was covered in part with fine brown hair. Under the pigmented skin were a number of tumors of varying sizes. Some of the tumors were firm (neurofibromas?) and some were soft and lobulated (lipomas or nevi?).

The report is accompanied by pictures of the patient.

WILLIAMSON, New Orleans.

ERYTHEMA MULTIFORME WITH SEVERE INFECTIOUS SYNDROME AND LYMPHOCYTIC MENINGITIS WITH RECOVERY. RENÉ MARTIN, CHASSIGNEUX and JEAN PARIS, Bull. Soc. de pediat. de Paris **30**:442 (July 12) 1932.

A boy, aged 8½ years, was admitted to the Pasteur Hospital with typical symptoms of meningitis. He also had a cutaneous eruption resembling erythema multiforme. He was thought to be suffering from meningococcic meningitis. The spinal fluid, however, did not support such a diagnosis; it was clear and contained 145 lymphocytes per cubic millimeter, and no bacteria were found in numerous smears and cultures. Blood and spinal fluid were injected into guinea-pigs and monkeys, with negative results. Within about a week after the sudden onset of the illness the cutaneous lesions had disappeared, and only a little desquamation remained; about one week later all evidence of meningitis had disappeared. The child was subsequently observed and was found to show no sequelae.

BENJAMIN, Montreal, Canada.

VERRUCOUS PIGMENTARY HYPERKERATOTIC NEVUS WITH ZONULAR DISTRIBUTION. E. LESNÉ, ROBERT CLÉMENT and Y. BOQUIEN, Bull. Soc. de pediat. de Paris **30**:448 (July 12) 1932.

A boy, aged 7 years, showed multiple nevi distributed over the left side of the trunk and over the left upper and lower extremities. The nevi seemed to follow closely the segmental distribution of the nerves. The pigmentation was almost entirely limited to the axillary and popliteal fossae. Biopsy was performed, and the verrucous keratotic nature of the nevi was confirmed.

BENJAMIN, Montreal, Canada.

PIGMENTARY HYPERTRICHOSIS IN SPOTS, PRODUCED ARTIFICIALLY. E. LESNÉ, ROBERT CLÉMENT and PIERRE GUILLAIN, Bull. Soc. de pediat. de Paris **30**:451 (July 12) 1932.

A girl, aged 12½ years, had eight discrete areas of pigmentation and hypertrichosis on the superior half of the back. These areas corresponded exactly to the sites on which dry cups had been applied a few months previously, when she was suffering from measles and bronchitis. The possibility of latent nevi brought out by the cupping is mentioned, and a possible endocrine disturbance produced at puberty, when the hair follicles and other cells in the skin are stimulated to function, is discussed.

BENJAMIN, Montreal, Canada.

TUBERCULOUS PRIMARY COMPLEX OF THE SKIN. RUDOLF BEZENCNY, Dermat. Wchnschr. **96**:58 (Jan. 14) 1933.

A 13 year old girl had a vesicular lesion on the cheek with associated enlargement of the local lymph nodes. The lesion on the cheek ulcerated and became indurated; clinically it suggested a chancre, but dark-field examination showed no spirochetes. The blood count showed 4,200 white cells, of which 56 per cent were lymphocytes. The epicutaneous tuberculin test was strongly positive. There was no evidence of visceral tuberculosis. The ulcer was excised. Histologically, it showed tuberculosis with many acid-fast bacilli. Three months after the excision typical lupus vulgaris developed in the scar. The case is considered an example of primary tuberculosis of the skin.

TAUSSIG, San Francisco. [ARCH. DERMAT. & SYPH.]

CERTAIN OBSERVATIONS CONCERNING ECZEMA VACCINATUM (VACCINE GENERALISATA). G. STÜMPKE, Dermat. Ztschr. **65**:95 (Dec.) 1932.

The author reports the cases of four children with eczema in whom vaccinia developed. None of them had been vaccinated, but they were infected by contact with other vaccinated children. In two of the cases the vaccinia appeared only on portions of the skin previously affected with eczema. In the other two the eruption also occurred on otherwise healthy skin. The recent literature is briefly reviewed.

TAUSSIG, San Francisco. [ARCH. DERMAT. & SYPH.]

CHOLESTEROCHROMIA. KURT OCHSENIUS, Monatschr. f. Kinderh. **57**:260, 1933.

A child showed numerous pigmented spots on the skin (xanthoma). The condition cleared up with small doses of solution of potassium arsenite. The author does not claim that arsenic is a cure for all cases of cholesterochromia.

GERSTLEY, Chicago.

ERYTHEMA NODOSUM IN PRIMARY EXTRAPULMONARY TUBERCULOSIS. A. WALLGREN, Acta pædiat. **13**:465 (June 6) 1932.

When erythema nodosum depends on allergy to tuberculosis, its occurrence almost always coincides with that of the initial fever. In 1927, Wallgren described cases of erythema nodosum associated with tuberculosis of the cervical lymph nodes, which suggested that the involvement of the glands was part of the primary complex and that the primary focus was extrapulmonary, probably located in the pharynx, though it had not been identified. In 1928, Fernbach described a patient in whom the primary focus was demonstrated in the tonsils.

Wallgren presents the cases of two patients with erythema nodosum, a positive tuberculin test, initial fever, enlargement of the cervical lymph nodes and a probable primary focus in the oral cavity. In one of the patients there was an ulcer of the gums, which was proved to be tuberculous by section and inoculation of guinea-pigs; the tonsils of the other patient were removed and were found to be tuberculous. In both cases, the lungs were clear on physical and on roentgen examination. Analogous to the periadenitis that extends from the hilar nodes at the height of the initial fever in cases of epituberculosis, in one of the patients there was an edematous reaction about the tuberculous cervical nodes.

Two other cases of tuberculosis of the tonsils and of the cervical lymph nodes are described, both associated with erythema nodosum. In these cases also, although the lungs were not examined roentgenologically, it is highly probable that the primary focus was extrapulmonary.

The author calls attention to the rarity of tuberculous gingival ulcers in childhood. His patient was 2 years old.

MCINTOSH, New York.

Surgery and Orthopedics

MESENTERIUM COMMUNE WITH INTESTINAL OBSTRUCTION. ALAN R. MORITZ, Am. J. Path. **8**:735 (Nov.) 1932.

Four cases of mesenterium commune are described, three of which gave rise to intestinal obstruction secondary to the hypermotility allowed by the defective mesenteric attachment. In two cases the obstruction was caused by a 360 degree clockwise volvulus. It is pointed out that the surgeon should be able to recognize whether the condition is a reversed rotation of the intestine or a secondary volvulus due to defective fixation.

MOORE, Cleveland.

TREATMENT OF OSTEOGENETIC SARCOMA BY MEANS OF IRRADIATION. G. E. PFAHLER AND L. D. PARRY, Am. J. Roentgenol. **25**:761 (June) 1931.

After a review of the work done at other clinics and a study of fifty-eight cases, the authors feel justified in concluding that the only two methods of treatment for osteogenic sarcoma are irradiation or surgery or the two combined. The results from irradiation seem to be at least equally as good as, and possibly better than, those obtained by surgical measures alone. Preliminary irradiation of the area of the tumor and irradiation of the pulmonary area followed by amputation gave the best results, but on the basis of Holfelder's observations the authors did not wait long enough for the full beneficial effect of the irradiation. A biopsy for diagnosis is desirable, but it should be preceded by a preliminary, thorough course of deep roentgen irradiation for a month. An accurate diagnosis is still the most important single element in the therapeutic management of osteogenic sarcoma. There is a bibliography.

STULIK, Chicago.

ACUTE RECURRENT INTUSSUSCEPTION IN CHILDREN: CASE REPORTS. AUGUSTUS THORNDIKE, JR., New England J. Med. **207**:649 (Oct. 13) 1932.

Detailed reports of five cases of acute recurrent intussusception are recorded. A ratio of acute postoperative recurrence in acute intussusceptions of 1:80 is found in a total of four hundred cases from the Childrens Hospital, Boston. In this series, the longest interval between the first and second attack was ten months; the shortest interval was two months, and the average was five months. In no case did the condition recur more than once.

A total of seventy-five reports of cases of acute recurrent intussusception in children has been collected from the literature. The symptomatology and differential diagnosis are discussed.

The treatment of recurrent intussusception should be surgical. The operative results in this series of five cases were 100 per cent recovery. Because of the previous history, acute recurrent attacks of intussusception are usually diagnosed earlier than primary attacks.

GENGENBACH, Denver.

ACUTE APPENDICITIS IN CHILDHOOD. HUGHES KENNEDY, JR., South. M. J. **25**:942 (Sept.) 1932.

The author points out the importance of always keeping the possibility of acute appendicitis in mind even in the youngest infant. In arriving at the final diagnosis, both the history and the physical findings are important. Tenderness, localized over McBurney's point, is the most important physical finding. Next in importance is localized rigidity. Marked constipation is additional evidence. Lack of vomiting is of no importance. If, in the final diagnosis, acute appendicitis cannot be reasonably eliminated, the patient should receive the benefit of the doubt and should be operated on. No purgative should be given until acute appendicitis is positively ruled out.

SCHLUTZ, Chicago.

CHRONIC INTUSSUSCEPTION IN CHILDREN. D. M. SUTHERLAND, Arch. Dis. Childhood **7**:191 (Aug.) 1932.

A case of chronic intussusception of the ileocolic type in a boy, aged 3 years, is reported. The outstanding features of the case were the intermittent attacks of abdominal pain which were referred to the penis. There was no blood in the stools. A tumor was palpated in the right iliac fossa. The symptoms had lasted over a period of two months, the attacks occurring several times each day. At operation, chronic intussusception was found involving the terminal half inch of the ileum, which was invaginated for about 4 inches (10 cm.) into the ascending colon. The intussusception was reduced and the bowel found to be healthy.

KELLY, Milwaukee.

MECKEL'S DIVERTICULUM COMPLICATED BY PEPTIC ULCER. GERTRUDE HERZFELD, Tr. Edinburgh Med.-Chir. Soc., 1931, pp. 161 and 169; in Edinburgh M. J., September and October, 1931.

At the clinical meeting Herzfeld showed a boy, aged 9 months, with a history of severe rectal bleeding preceded a few hours before by abdominal pain. The hemorrhage then recurred. The physical and abdominal examinations gave no help in the diagnosis. Rectal blood was passed periodically for three weeks with a progressing anemia.

Anesthesia and a sigmoidoscopy gave no information. The child's progress was for the worse, so a blood transfusion was given, and on the following day the abdomen was opened. Five feet above the ileocecal valve a coil of the small intestine was found adherent to the apex of the bladder, and there were recent adhesions between two portions of the bowel. When these were separated, the Meckel diverticulum was found, with an ulcer at the junction of the diverticulum with the ileum. Resection of the affected loop was followed by a slow, steady recovery. One other case previously showed a similar peptic ulcer which made itself known by perforation and general peritonitis. Early operation was performed with ultimate recovery.

NEFF, Kansas City, Mo.

A CASE OF EXOMPHALOS. NORMAN M. DOTT, Tr. Edinburgh Obst. Soc., 1932, p. 105; in Edinburgh M. J., Aug., 1932.

This case illustrates the embryonic type of congenital umbilical hernia and its surgical treatment. The author expresses it cleverly by stating that the umbilical cord of higher animals borrows a portion of the abdominal wall found in the more primitive forms of animals, so that the viscera protrude into the cord, thereby becoming an integral part of the wall during early embryonic life. When at last the embryo in its development becomes ready to use the tissue of the cord in another way, the viscera are quickly withdrawn into the abdomen and the umbilical opening sealed up. There are various degrees of failure to abolish the umbilical hernia. The largest amount of malformation remains when a great deal of the abdominal viscera is left in the umbilical cord. Such is the nature of the case which the author records. Such a child at birth should pass straight to the operating table. The author discusses the difference between embryonic and fetal types. He then reports the history of this child, whom he operated on one and one-half hours after birth. The entire liver protruded through the abdominal opening as well as two thirds of the stomach, pancreas, the entire small intestine and a part of the large intestine. All of these organs were put into the abdomen. The abdominal wall was gradually stretched and brought over the viscera and sutured. The sutures held; the feeding was mother's milk, and the child has made a normal convalescence and is well developed at 1 year of age. In the discussion by Dr. Haultain, emphasis was placed on the teaching in obstetrics that the attendant should think of the possible presence of small loops of bowel in the proximal portion of the cord. At the time of delivery the cord should be milked

toward the abdomen carefully so as not to injure any loop of bowel when the cord is cut. He had seen two infants die from such accidents.

NEFF, Kansas City, Mo.

CALCULUS FORMATION IN THE RENAL PELVIS, URETER AND BLADDER. DUNCAN M. MORISON, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 163; in Edinburgh M. J., October, 1932.

At a clinical meeting, Morison presented three children. A boy, aged 3 years, had had enuresis since birth, and finally dysuria developed. Calculi were revealed by roentgen pictures of the posterior urethra, renal pelvis and left ureter. In the way of treatment, the urethral stone was pushed back into the bladder and crushed. The ureter is to be dilated in order to insure good drainage.

A girl, aged 6 years, had a stone of the bladder removed by the suprapubic route. At 8 years, recurrent attacks of pain began in the left side of the abdomen, and persisted until the patient was 10 years old. Pus and colon bacilli then appeared in the urine, and roentgen shadows in the left ureter suggestive of stone. Nephro-ureterectomy was performed because of total occlusion of the left kidney. The recovery was satisfactory.

A boy, aged 2½ years, had constant enuresis since birth, with progressive dysuria. The urine contained pus, many red cells and micro-organisms. The film taken revealed a walnut-sized stone in the bladder, which was satisfactorily removed by suprapubic operation.

NEFF, Kansas City, Mo.

CASES OF EMPYEMA. CHARLES MCNEIL, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 168; in Edinburgh M. J., October, 1932.

Professor McNeil presented four cases of empyema which showed some differences. The first two during the early stage of pneumonia gave some symptoms which would permit one to anticipate the complication of empyema. Such signs are early thoracic pain and extensive dulness, with an unusually stormy early febrile stage. The early pleural pain and friction were present in both children, but empyema developed in only one.

The third child, aged 2½ years, was treated conservatively for a right-sided empyema complicating pneumonia, because there were also pneumonia at the left base and a congenital defect and enlargement of the heart. Rib resection would have been dangerous, while the simple insertion of a small tube between the ribs was safe and adequate for the final complete recovery.

A fourth case was found to be a deep-seated interlobar empyema, hard to locate by operation. A tube was made to reach the cavity, and the empyema gradually disappeared.

NEFF, Kansas City, Mo.

SUPPURATIVE APPENDICITIS IN THE COURSE OF MEASLES COMPLICATED WITH BRONCHOPNEUMONIA. M. G. FERRU, J. PERDOUX AND J. MICHIELS, Arch. de méd. d. enf. **35**:466 (Aug.) 1932.

It has been commonly noted that appendicitis developing during the eruptive stage of measles is usually benign, the inflammation as a rule subsiding with the exanthem. This view has been advanced particularly by Professors Teissier and Hutinel.

The case reported by the authors did not conform to such observation in any particular. A boy of 5 years, in the course of a moderately severe attack of measles, was seized with violent abdominal pain accompanied by vomiting, on the second day of the eruption. Diarrhea developed almost synchronously with these symptoms, and although the pain, at first diffuse, gradually shifted to the right iliac region, the latter syndrome was explained by the findings in the lower right side of the chest, where a small area of bronchopneumonia was clearly defined. In the absence of rigidity, appendicitis was excluded; symptomatic treatment, however, failed to relieve the patient, and within a few hours the abdominal

picture was complicated by distention, with more pain and with continuous vomiting. An icebag was applied, and the child was removed to the hospital, where, under local anesthesia an appendical abscess was opened and drained. Recovery from all three infections was reported on the fifteenth day following invasion.

AMESSE, Denver.

HEMATOCOLPOS IN A GIRL OF SIXTEEN YEARS: OPERATION FOLLOWED BY PYOSALPINX. DECHERF, Bull. Soc. d'obst. et de gynéc. **21**:198 (March) 1932.

The patient had always been well but had never menstruated. Periodically, however, each month for a period of two years she had suffered from pain in the lower part of the abdomen. For three weeks this pain had been very severe. Vomiting developed. A diagnosis of hematocolpos was made, which was treated by incision, about a liter of sanguineous fluid being released. A week later, following the administration of a cathartic, a severe pain developed that was localized at McBurney's point. There was no palpable mass. Operation showed a normal appendix but a right pyosalpinx. This was drained. Three days later pain developed in the left lower quadrant, and a diagnosis of left pyosalpinx was made, which was confirmed by operation. She made an uneventful recovery. Two months later she returned to the clinic, having suffered meanwhile from a slight pain in the left lower quadrant of the abdomen. The left ovary, most of the left fallopian tube, and the entire right fallopian tube were removed. Recovery was uneventful.

GLASER, Rochester, N. Y.

A CASE OF VESICAL CALCULUS. M. COFFIN, Bull. Soc. de pédiat. de Paris **30**:385 (June 21) 1932.

A girl, 6 years old, had incontinence of urine. She showed no evidence of calculus at the first examination. She improved temporarily but soon began to have frequency, urgency, pain over the area of the bladder and terminal hematuria. Roentgen examination revealed the presence of numerous stones in the bladder. These were removed at operation, when it was noted that the urethra was imperfectly formed and the urine was being excreted into the vagina through a vesicovaginal opening. Two years later she was again operated on, and a number of stones were removed from the bladder. It was planned to close the vesicovaginal fistula and transplant the ureters at a later date. The ascending infection was responsible for the repeated formation of calculi. The temporary improvement in the incontinence with the appearance of calculi in the bladder is difficult to explain.

BENJAMIN, Montreal, Canada.

OVEREXTENSION OF THE KNEE JOINT OF CHILDREN. MAX BÖHM, Deutsche med. Wchnschr. **58**:1835 (Nov. 18) 1932.

In the first six months of life the slightly flexed position of the knee joint is physiologic. After this time a hyperextended position occurs normally. This hyperextension can be explained by the fact that the femur of young children has a more curved epiphyseal end than the femur of adults. This anatomic difference allows a greater extension than in later life. If the flattening of the epiphyseal end of the femur fails to occur, or is delayed, a pathologic condition, genu recurvatum, may occur. Also some of the so-called rheumatic pains in the knee joint of young children can be explained on the basis of this greater mobility of the knee joint due to anatomic structure, which can be considered as normal for that particular age.

KERESZTURI, New York.

PURULENT PNEUMOCOCCIC PERICARDITIS CURED BY ETHYLHYDROCUPREINE. PHILIPP LEITNER, Jahrb. f. Kinderh. **136**:71 (June) 1932.

A review of the literature reveals ten deaths in fourteen cases. In the author's case, that of a boy of 6, recovery occurred. The pericardium was punctured

beyond the mamilla; pus was drained; the cavity was irrigated with 0.5 per cent solution of ethylhydrocupreine hydrochloride; from 6 to 8 cc. of 5 per cent solution was deposited. This was repeated three times at seven day intervals.

CLAUSEN, Rochester, N. Y.

Miscellaneous

SIGNIFICANCE OF INFANT MORTALITY DATA IN APPRAISAL OF AN URBAN COMMUNITY. A. D. H. KAPLAN, Am. J. Pub. Health **22**:1037 (Oct.) 1932.

The infant mortality in the United States fell from 99.9 per thousand live births in 1915 to 70 per thousand in 1928. However, the rate in the city of Denver remained at 91. By 1931 it had dropped to 77 per thousand live births. A study of the relation of various factors to the infant mortality in Denver was made with the following observations:

Housing: Among the people living in shacks along the Platte River, the rate was from 190 to 210 per thousand.

Racial Factors: The rate for Negroes was 63 per thousand; for Mexicans, 232 per thousand.

Family Income: For incomes of less than $500, the rate was 186 per thousand; for $3,000 and over, 25 per thousand.

Number of Children: The death rate for primiparae was 64; for noniparae, 220 per thousand. The average number of children for parents in the $250 income class was 4.12; for those with incomes of $3,000 and over, 2.04.

Causes of Death: In order of frequency, these were: prematurity, 32 per cent; pneumonia, 18 per cent; enteritis, 13 per cent; congenital malformations, 7 per cent, and birth injuries, 7 per cent. The general figures in the United States were: prematurity, 26 per cent; pneumonia, 13 per cent; enteritis, 12 per cent; congenital malformations, 8 per cent, and birth injuries, 7 per cent.

Prenatal Care: The rate varied from 198 for no prenatal visits to 30 per thousand for nine or more visits.

The author feels that this analysis of infant mortality of a community offers significant clues to its social economic problems. PARKER, Rochester, N. Y.

NIRVANOL ERUPTIONS. JOHN F. MADDEN, Arch. Dermat. & Syph. **26**: 1065 (Dec.) 1932.

The administration of nirvanol, or phenyl-ethyl-hydantoin, a drug used in the treatment of chorea, results in a definite syndrome in patients. This syndrome includes fever, sedation, eosinophilia and an eruption on the skin. This eruption is described in detail by the author. It usually appears between the ninth and twelfth day of the use of the drug; it appears first on the chest and abdomen and spreads to the extremities (most intensely on the extensor surfaces); it is characterized by discrete, bright red, macular lesions, and it disappears after three or four days (it leaves no desquamation). These cutaneous signs sometimes simulate scarlet fever and measles, and often must be differentiated from these conditions. The history, theories of action (the exact action is not known), complications (few) and prognosis (good) of the use of this drug are included.

EKERMEYER, Iowa City.

STICK DEVELOPMENTAL TESTS. F. H. CLARK, Arch. Pediat. **49**:601 (Dec.) 1932.

The article does not lend itself to abstracting.

WADDELL, University, Va.

THE RELATION OF SEXUAL MATURITY TO SEROLOGICAL MATURITY AND RESISTANCE TO INFECTION. CHARLES HERRMAN, Arch. Pediat. **49**:785 (Dec.) 1932.

The writer reviews the literature on this phase of immunity. He feels that acquired immunity to the infectious diseases is largely the result of subclinical

attacks, and that such attacks tend to develop a potential capacity which already exists. It is suggested that this theory is not incompatible with the existence of immunity in isolated groups which have not been exposed to infection. Nonspecific infections may be sufficient to develop a latent capacity. When large groups are relatively immune, it is probably due to the gradual elimination of nonresistant strains. Attention is called to the fact that as the child grows and matures, its power of resistance to the infectious diseases increases, reaching its maximum at puberty. The low death rate at puberty may be the result of increased activity of the endocrine system, the resistance to infectious diseases appearing to depend on the adequacy of the endocrine system, which, in turn, depends on hereditary factors.

WADDELL, University, Va.

EVERY CHILD IS DIFFERENT. W. P. LUCAS and HELEN B. PRYOR, California & West. Med. **38:** 163 (March) 1933.

The authors discuss the fallacy of comparing all children to rigid height-weight-age standards without taking into account the variations in the type of body build. They present a "width-length index" based on the ratio $\frac{\text{bi-iliac diameter}}{\text{stature}} \times 100$, point out its relationship to variations in weight and give a table of width-length indexes based on a study of 2,000 children.

The authors emphasize the unfavorable psychologic effect on children of forcing them to conform to artificial standards, particularly in regard to its relationship to diet. Recognition of individual requirements of diet will solve most problems of anorexia.

MARSHALL, San Francisco.

CHILD HEALTH AND PROTECTION FROM THE DOCTOR'S VIEWPOINT. E. H. CARY, J. Pediat. **1:**537 (Nov.) 1932.

The responsibility for leadership in health education and preventive medicine must rest on the physician because of his training and experience. In the past many physicians have hesitated to take an active part in public health movements because of their desire to avoid any possible appearance of being unethically engaged. However, it is the duty of physicians to cooperate with lay organizations and public health departments to make accessible to every one the knowledge that scientific medical research has shown to be of value in the prevention of disease and accidents. The medical profession should be the major force in proposals for the solution of the vast problems concerning adequate medical service. Dr. Cary advises physicians to express their convictions more definitely and to work together with the people who recognize that medicine has assumed a public character.

LEMASTER, Evanston, Ill.

THE RESPONSIBILITY OF THE CHILDREN'S HOSPITAL TO ITS INTERNS. THOMAS B. COOLEY, J. Pediat. **1:**661 (Dec.) 1932.

Besides caring for the sick, the hospital has a definite responsibility for the adequate training of its interns. At the present time, an intern's hospital service usually prepares him for the diagnosis and treatment of serious diseases, but does not afford sufficient opportunities to observe normal children, the beginnings of disease and the handing of minor illnesses. The outpatient department should constitute a part of every pediatric intern's education, and, preferably, this service should be under the direction of experienced staff physicians.

A "well baby" clinic supervised by a physician really interested in normal growth and development could be one of the most valuable of the intern's experiences. Child guidance or behavior clinics furnish experience necessary for every practicing pediatrician. Ward rounds and clinical-pathologic conferences furnish opportunities for the staff physicians to help considerably in the intern's training.

LEMASTER, Evanston, Ill.

A Comparative Study of the Ultraviolet Ray Intensity of the Sun in Miami, Florida. Carl Scheffel, M. J. & Rec. **137**:403 (Nov. 16) 1932.

For the study of the ultraviolet ray intensity of the sun in Miami, the author used the Leonard Hill method of measurement. The readings were made at Coral Gables, 3 feet (91 cm.) above the ground and 13 feet (396 cm.) above sea level, where shadows could not reach the exposed solution. There was much less rain the year of the study than usual. At the same time, Hernandez and McKinley made measurements in San Juan, Puerto Rico. Both tables are given in the paper. Measurements reported in California are given in a third table, and a comparative evaluation of all readings reported in tables I, II and III, in terms of units required to produce erythema in the average white person's untanned skin, is given in a fourth table. Some authorities consider that erythema shows the maximal dosage which should not be overstepped.

Williamson, New Orleans.

Current Prevalence of Communicable Diseases in the United States. Pub. Health Rep. **47**:1469 (July 8) 1932.

For the period from May 22 to June 18, 1932, typhoid fever rose in its usual seasonal incidence particularly in the east north central, south central and mountain and Pacific groups. Poliomyelitis also rose in all sections, although still being 13 per cent below the corresponding time of last year. Measles also shows an increase, there being 63,506 cases reported. This rise was particularly in the east north central states.

Smallpox, scarlet fever, influenza, diphtheria and meningitis all show a decrease.

The average mortality rate was 10.7 per thousand. This is the lowest mortality rate reported in the last seven years for which records are available.

Fatigue in School Children. J. T. Thornton, West Virginia M. J. **28**:542 (Dec.) 1932.

The importance of chronic fatigue in school children is greatly underestimated. Faults in child rearing productive of chronic fatigue may menace national existence.

Chronic fatigue and malnutrition are intimately associated, as are chronic fatigue and bad body mechanics.

Unjust censure and punishment may be meted for poor school work, when the trouble is due to fatigue.

Negative home atmosphere, improper foods, hurried meals, eating between meals, inadequate sleep and overstrain by the school curriculum and by extra-curricular studies (music lessons, dancing, etc) are potent factors in the etiology of chronic fatigue.

School health work needs revision. Hygiene and child care should be taught in the advanced grades and in the high school.

More serious study of all the causes of chronic fatigue in school children, with a view of correcting them, is essential and urgent.

Shawkey, Charleston, S. C.

The Pediatrician and the General Practitioner. R. C. Hood, West Virginia M. J. **28**:548 (Dec.) 1932.

The author pays tribute to the worth and importance of the general practitioner, the family physician, and stresses the importance of every precaution to avoid any reflection on his skill or any word or act that might lessen the confidence of his patrons in him.

Emphasis is placed on the importance of maintaining a cordial and helpful relationship between the pediatrician and the general practitioner, keeping always in the foreground the interest of the patient.

Mention is made of a considerable number of problems of diagnosis and treatment in which, because of his special training, the pediatrician should be able to be helpful to the family physician. These problems are mentioned only as examples of cases in which consultations should be mutually pleasant and helpful to all concerned.

SHAWKEY, Charleston, W. Va.

LIGHT AND AIR IN MAINTENANCE OF HEALTH. LEONARD HILL, Brit. J. Phys. Med. **7**:95 (Sept.) 1932.

The author discusses the reduction in the incidence of tuberculosis and respiratory diseases among monkeys at the Zoological Garden in London. He believes that the important factor has been a change from glassed-in quarters where greenhouse temperatures were maintained to open air houses where the animals have free access to the outside and where only the sleeping shelves are warmed.

HARTMAN, Cleveland.

THE NATURE, PROPERTIES, AND USES OF INFRA-RED AND LUMINOUS RAYS. AUSTIN FURNISS, Brit. J. Phys. Med. **7**:121 (Oct.) 1932.

The author has divided his paper into two parts. In part 1, he discusses the penetrating power of various classes of rays.

The luminous and near infra-red irradiations penetrate most deeply and are most useful. He compares the percentage composition of the mercury arc, carbon arc, tungsten and sunlight in respect to ultraviolet, infra-red and visible light irradiation. The physical characteristics of the following sources are described: the carbon filament lamp, the tungsten filament lamp, the K. B. B. Gallois infra-red projector lamp, the infra-red glower, the clinical gas lamp, the Klein-Strahler lamp and the pure infra-red generator.

HARTMAN, Cleveland.

THE NATURE, PROPERTIES AND USES OF INFRA-RED AND LUMINOUS RAYS. AUSTIN FURNISS, Brit. J. Phys. Med. **7**:143 (Nov.) 1932.

In the second part of this article the author discussed the uses of infra-red and luminous rays. In some cases the technic of treatment was described in detail. The author was enthusiastic about the results obtained in the treatment of otitis media and mastoid disease. He said that infra-red rays had been used successfully in the treatment of pylorospasm. The application was made to the back. The use of these rays in genito-urinary and gynecologic, dental and respiratory conditions was reviewed.

HARTMAN, Cleveland.

HEREDITY OF THE CEPHALIC INDEX. PAUL GODIN, Bull. Soc. de pédiat. de Paris **30**:271 (April) 1932.

The cephalic index was studied in the parents and in the first-born male infants of thirty families. The index followed that of the mother, whether dolichocephalic or brachycephalic, in 70 per cent and that of the father in 3.33 per cent, and was a mixture of the two in 26.7 per cent.

BENJAMIN, Montreal, Canada.

VARIATION IN THE CEPHALIC INDEX DURING THE YEAR OF ATTAINMENT OF PUBERTY IN THE TWO SEXES. PAUL GODIN, Bull. Soc. de pédiat. de Paris **30**:274 (April) 1932.

Twenty-three boys 14 years of age and twenty-three girls from 11 to 12 years old were studied. There was a greater change in the cephalic index at puberty in the female than in the male sex. The transverse diameter of the skull showed a greater increase than the anteroposterior diameter in 60 per cent of the boys and in 56 per cent of the girls; i. e., the growth of the skull at puberty tends toward a brachycephalic index.

BENJAMIN, Montreal, Canada.

INFANTS' DISEASES IN 1932. P. LEREBOULLET and F. SAINT GIRON, Paris méd. **2**:353 (Nov. 5) 1932.

The annual review of the French literature for the past year by the authors contains: hygiene of infancy, diet, diseases of the new-born, hepatic disturbances, the nervous system, poliomyelitis, acrodynia, mongolism, enuresis, pulmonary abscess, pleurisy, pericarditis and infectious diseases. SANFORD, Chicago.

PROBLEM OF HOSPITALIZATION OF INFANTS. A. IANCOU, Rev. franç. de pediat. **8**:192, 1932.

The author presents eighty-three cases of infants under 2 years of age, seventy-five of whom were in the first year. Fifty of these infants showed hypophosphatemia. The author therefore believes that even under the best possible conditions, infants under 1 or 2 years of age who are hospitalized are more subject to rickets than infants who are not hospitalized. SANFORD, Chicago.

CARE OF THE MILK TEETH. E. D'AMARO, Prat. pediat. **10**:219 (May) 1932.

The author emphasizes the relationship between the preservation of the milk teeth and the general health of the child. Before the eruption of the teeth, his practice is to rinse the baby's mouth with 4 per cent sodium bicarbonate solution; as soon as cereal is added to the diet, he wipes the mouth with the same solution. After a solid diet is started, he brushes the teeth with hydrogen dioxide solution.

DOOLEY, Kent, Conn.

PECULIAR EFFECTS OF VEGETATIVE POISONS IN CHILDHOOD. EDITH KRÜGER, Arch. f. Kinderh. **98**:55 (Dec. 13) 1932.

Ergotamine tartrate, Sandoz was administered to eighty children, and a sedative effect usually ending in sleep was noticed in most of them. Atropine produced a sedative effect only in the younger children. Pilocarpine showed practically no narcotic effect alone, but seemed to augment the sedative effect of ergotamine tartrate when they were given together. The author believes it should be recognized by all physicians that drugs affecting the sympathetic or parasympathetic nervous system of children also frequently produce a definitely sedative action which does not occur in adults. Whether this result is due to an effect on the central nervous system or to a peripheral regulatory mechanism is uncertain.

LEMASTER, Evanston, Ill.

ANOXEMIA IN ACUTE ARSINE POISONING. F. LÖNING, Deutsches Arch. f. klin. Med. **173**:177 (July 27) 1932.

The author describes eleven cases of arsine (AsH_3) poisoning in detail. Arsine not only destroys hemoglobin, causing a hematogenous icterus, but also reduces hemoglobin, causing a generalized cyanosis. It differs from other similar poisons in that it does not produce methemoglobin. In the anoxemic stages it resembles "mountain sickness," and should be treated by means of frequent transfusion with blood saturated with oxygen. Later treatment is concerned with blood regeneration and the combating of the damage to the kidneys and liver.

DOOLEY, Kent, Conn.

THE STATE LABORATORY OF THERAPEUTIC PEDAGOGY FOR PATHOLOGY AND TREATMENT, BUDAPEST: PROGRAM, ORGANIZATION AND SCOPE OF WORK. L. SZONDI, Konstitutionsanalyt. Beitr. z. Psychiat. d. Kindesalters, 1931, p. 173.

The laboratory was founded for a double purpose: research and instruction. The work is conducted on feebleminded, blind, deaf and dumb and neglected persons. The organization is divided into departments of genealogy and eugenics, con-

stitutional anthropology and constitutional analysis, radiology, biochemical researches and constitutional psychology. The author stresses the fact that the institution attempts not only to correct the deficient talents but to study and treat the entire personality from every angle—educational, medical, social, religious, etc.

LEMASTER, Evanston, Ill.

CRITICISM OF THE BORNHARDT INDEX OF BODY TYPE ON THE BASIS OF EXPERIMENTS UNDER NORMAL AND PATHOLOGIC CONDITIONS. ST. V. MADAY, Konstitutionsanalyt. Beitr. z. Psychiat. d. Kindesalter, 1931, p. 247.

The Bornhardt index of body type is analyzed in detail. This index was used in measuring 952 well children and 119 defective children, and the results were studied statistically. The author concludes that the index is fairly reliable from a biologic point of view, but is mathematically faulty, empirically unnecessary and unsuitable for scientific work because of the wide variations.

LEMASTER, Evanston, Ill.

A RESPIRATION CALORIMETER FOR INFANTS. H. SCHADOW, Jahrb. f. Kinderh. **137**:318 (Dec.) 1932.

A calorimeter which permits simultaneously direct and indirect calorimetry of infants is described.

CLAUSEN, Rochester, N. Y.

TEETHING DIFFICULTIES. F. ROTHENBERG, Med. Klin. **28**:333 (March 4) 1932.

Difficulties with teething in infancy are the rule, and the skeptical attitude of medical science is not justified. The cutting of the teeth is not an active process as it was thought to be. It has nothing to do with pushing the teeth upward through growth of the root. This theory overlooked entirely the simultaneous growth of the jaws. Landsberg's studies have shown that the growing tooth does not move. It is really carried to the surface of the jaw through the growing alveolus, while the resorption of the alveolar roof brings the crown of the tooth more and more to a prominence. Therefore, from the physiologic point of view, the teething ring has certain significance and justification. Through biting on this ring, increased pressure is produced, which helps the resorption of the alveolar roof and stimulates the uncovering of the dental crown.

ZENTAY, St. Louis.

ROENTGEN TREATMENT IN CHILDHOOD. R. GLAUBER, Med. Klin. **28**:513 (April 8) 1932.

This is a report of the cases of two patients. One had toxic septic lymphadenitis following ulcerative angina; the other had otogenous septicemia. Both were almost given up as lost before roentgen treatment was employed. In both cases immediate change and improvement followed roentgen treatment. The author thinks that such treatment should be used more often than it is, if possible in the early stages of the disease when the results probably will be still more satisfactory.

ZENTAY, St. Louis.

CHRONIC LEAD POISONING IN CHILDHOOD. A. VIETHEN, Samml. v. Vergiftungsfällen, 1931, vol. 2, no. 11.

A 4 year old boy died of lead poisoning six months after swallowing a small lead object which remained in the stomach. Chemical examination of the blood revealed lead, but other usual findings in lead poisoning were absent. The child remained free from symptoms until the onset of headache, vomiting and muscular spasms which appeared only a few days before death.

LEMASTER, Evanston, Ill.

THERAPEUTIC EFFECT OF INJECTIONS OF BLOOD IN CONTAGIOUS DISEASES AND HEMORRHAGIC DIATHESIS (HETEROHEMOTHERAPY). JAN LACINA, Časop. lék. česk. **70**:680 (May 8) 1932.

Injections of blood are of value not only in replacing blood elements, but also as stimuli to the hematopoietic system. Intramuscular injections are also of value in hemostasis and as antitoxic and anti-infectious agents. The author cites three cases in which injections of the blood of the father or mother into the muscle of the child were of value in hemostasis (hematuria, petechiae and hemorrhagic diathesis) and had a beneficial effect on the progress of the disease. Good results were obtained in pneumonia, erysipelas, polyarthritis rheumatica, bronchopneumonia and a case of obscure meningeal irritation. A preparation of quinine and camphor was added to the blood in some instances and seemed to enhance the value. The average amount of blood injected was 20 cc., and the usual site was the gluteus muscle.

STULIK, Chicago.

ORGANIZATION OF SYSTEMATIC DENTAL CARE of SCHOOL CHILDREN IN THE CZECHSLOVAK REPUBLIC. BEDRICH NEUMANN, Sborn. lék. **31**:50 (Feb.) 1931.

The author outlines his suggestion as follows: There is necessity for dental work because of gross dental caries (in from 95 to 97 per cent) and because of the sequelae (health, social and economic). The present organization is of limited scope. Dental hygiene requires executive and medical and dental organization. The financial structure involves equipment, organization and material. Financing could be carried out through cooperation of parents, public funds and insurance funds (health insurance). In smaller communities the use of the automobile ambulance equipped as a mobile dental dispensary is suggested. Photographs of such an ambulance are presented.

STULIK, Chicago.

ANODONTIA CONGENITA VERA. JAN FRIDRICHOVSKY, Sborn. lék. **31**:259 (Aug.) 1931.

The author reviews the literature and discusses the various theories of anodontia. A girl of 4 years came to the clinic, and on examination only seven teeth were found in her upper arch. These were 3, 2, 1 | 1, 2, 3, 4. Her first tooth erupted at 6 months and her developmental history was normal. She had had pertussis and bronchitis and was well developed and well nourished. Her mother had typhoid fever during pregnancy. Roentgenograms revealed the following tooth buds in addition to the aforementioned erupted teeth: $\frac{7, 6}{7, 6} \mid \frac{6, 7}{6, 7}$. The lower jaw was poorly developed, and the alveolar arch where no teeth had erupted was atrophic. No other gross defect was noted.

STULIK, Chicago.

WELFARE ASSOCIATION FOR EDUCATION AND REARING OF PRESCHOOL CHILDREN. HELENA GIRTLEROWA, Zycie Dziecka **1**:3 (April) 1932.

This society was organized in 1903 by Mrs. Radziwill. After the war it increased its activities to a great extent by organizing special courses for teachers and by publishing a magazine called *Preschool Children.* It organized advisory clubs to promote physical, moral, spiritual and vocational guidance. Lately the members organized hygiene and preventive medicine clinics in which children are given toxoid, vaccination and scarlet fever antitoxin. The society receives enthusiastic support by the public and government.

KRUPINSKI, Chicago.

CENTRAL INSTITUTE OF PHYSICAL EDUCATION IN WARSAW. PIOTR WOJCEK, Zycie Dziecka **1**:19 (April) 1932.

The central institute is elaborately equipped for physical education. The purpose is to train physical directors and teachers and to promote research along these

lines. The pupils are taught not only physical education but also physiopathology, and this part of the education is under the supervision of a physician and surgeon.

KRUPINSKI, Chicago.

IS THE SENSIBILITY IN ALLERGY GENERAL? ERNST B. SALEN, Acta med. Scandinav. **78**:197 (July 23) 1932.

The cells carrying the allergic reactivity (endothelial cells) are sensitized everywhere in the body, without regard to clinical symptoms, in bronchial asthma, urticaria or Quincke's edema. Whether the clinical manifestations are localized to one organ only or are more generalized depends, among other factors, on the mode of introduction of the allergic agents and on the dose.

To illustrate this thesis, the author relates the history of a patient in whom Quincke's edema of the face developed after the eating of nuts on two occasions during a seven year interval. When an attempt to test his reaction to nuts was made by the injection of an extract of 0.2 mg. of nuts intracutaneously severe symptoms of asthma developed, followed by epigastric pain, vomiting, collapse, unconsciousness and loss of sphincteric control. The patient recovered after injections of epinephrine and camphor. Urticaria and edema of the feet and hands persisted for twenty-four hours. However, when the patient ate two almonds, vasomotor rhinitis developed without other manifestations.

That the urogenital tract may show symptoms of allergy is illustrated by the histories of two patients with asthma, who at the paroxysm had frequency and pain on urination. A culture of the urine was sterile; the sediment, however, contained many eosinophils.

KAJDI, Baltimore.

Society Transactions

NEW YORK ACADEMY OF MEDICINE, SECTION OF PEDIATRICS

Regular Meeting, March 9, 1933

JOHN CAFFEY, M.D., *Presiding*

STUDIES IN INFLUENZA. DR. PERRIN H. LONG, M.D.

During the past five years certain studies with regard to the etiology of influenza have been carried out in Baltimore under the auspices of the John J. Abel Fund for Research on the Common Cold. In this period three epidemics of influenza have been investigated. Extensive observations on the incidence of Haemophilus influenzae, the beta hemolytic streptococci, Diplococcus pneumoniae and the anaerobic, gram-negative, filter-passing flora of the rhinopharynx have been made in healthy persons and in persons suffering from disease of the respiratory tract. In addition, the hypothesis that the incitant of influenza may be a filtrable virus has been tested.

It has been found that the incidence of H. influenzae in influenzal years is not significantly higher than in noninfluenzal years, nor is the incidence of this organism in persons with influenza high enough to be of etiologic significance when compared with the findings in persons not suffering from the disease. However, there is some evidence to show that during a noninfluenzal year persons who are infected with H. influenzae during infections of the respiratory tract have a more severe type of disease than do those who are found to be free from infection with H. influenzae. In an influenzal year this difference between carriers and noncarriers does not exist. The beta hemolytic streptococcus and D. pneumoniae have been found to play the rôle of secondary invaders in influenza.

Although extensive studies have been undertaken to determine the incidence and the rôle of the gram-negative, filter-passing, anaerobic organisms of the rhinopharynx in health and in disease of the respiratory tract, no convincing evidence of their importance in the production of disease has been obtained. Bacterium pneumosintes has not been isolated, and therefore its relationship to influenza has been neither proved nor disproved. It is felt that a further accumulation of experimental evidence is necessary before the relationship of these minute anaerobic organisms to respiratory disease is settled.

Attempts have been made during the past three years to transfer influenza to chimpanzees by inoculating them with filtered rhinopharyngeal washings from persons ill with influenza. In the course of these attempts, disorders characterized by fever, prostration and leukopenia or a normal white blood cell count were transmitted to four chimpanzees by rhinopharyngeal inoculation with bacteria-free filtrates from persons ill with human influenza, and a similar condition was produced in a fifth ape during a nonepidemic period. The difficulty of interpreting with complete satisfaction the observations made on the apes is obvious, and the observed facts are therefore presented in the knowledge that they conform with those previously reported in man by other investigators.

STUDIES ON THE ETIOLOGY AND PATHOGENESIS OF WHOOPING COUGH. DR. ARNOLD RICE RICH.

It was pointed out that the infiltration of the bronchial walls by mononuclear cells which is characteristic of interstitial pneumonia occurs in pertussis uncomplicated by pneumonia. Since this interstitial change is a characteristic lesion of respiratory

diseases in which filtrable viruses have been shown to play an etiologic rôle or in which the activity of a virus is strongly suspected (measles, influenza, psittacosis and swine influenza), the possibility that this lesion in pertussis may be the effect of a filtrable virus must be considered.

Clinical, morphologic and experimental evidence was presented supporting the possibility that pertussis may belong to the group of diseases of the respiratory tract in which an invisible virus paves the way for the invasion of specific bacteria. Intranuclear inclusion bodies in the alveolar and bronchial epithelium in pertussis were demonstrated, and their significance was discussed.

The production of a catarrhal condition in chimpanzees by means of sterile filtrates of tracheal exudate and blood from children with pertussis was described, as well as the production of paroxysmal cough with lymphocytosis by means of large doses of Bordet-Gengou bacilli. Further work is being done to determine whether the virus which produces the catarrhal state predisposes to infection with the Bordet-Gengou bacillus and the influenza bacillus, and whether the virus is responsible for the durable immunity characteristic of pertussis. It was demonstrated that the influenza bacillus localizes in the cilia of the respiratory tract exactly as does the Bordet-Gengou bacillus, and the relation of the influenza bacillus to paroxysmal cough and to pertussis was discussed.

Regular Meeting, April 13, 1933

JOHN CAFFEY, M.D., *Presiding*

VARIABILITY IN WEIGHT OF THE THYMUS AND ITS COMPONENT PARTS IN HEALTH AND IN DISEASE. DR. EDITH BOYD.

Throughout the literature on disease involving the thymus gland, the upper limit of the normal weight of the thymus has been repeatedly used as a measure of the presence or the absence of either an abnormal constitutional state or simple hypertrophy. Such a use of an upper limit of normal weight presupposes a reasonably exact knowledge of the normal variability and changes due to age in the weight of this gland. Even a casual review of the literature indicates that there is no agreement in the estimates of either the upper limit or the average size of the thymus. Such values as 10, 15 and 20 Gm. are given by many authorities as the upper limit of normal size, while others state that the mean weight in certain age periods is more than 20 Gm.

Scrutiny of the basic data from which these deductions have been made indicates that the disagreement is entirely due to the selection of necropsy records for normal subjects. Many reports are based on weights taken from routine reports at necropsy without regard to the cause of death, even though as early as the eighteenth century biologists recognized that in animals the thymus was rapidly reduced in size by inanition. To avoid this effect, Friedleben, in 1858, used as normal thymuses those from children dying suddenly or from short illnesses. After the introduction in 1889, by Paltauf, of the concept of a lymphatic constitution characterized by prominent lymphoid tissue and thymus from which the afflicted person died spontaneously or of trivial causes, most writers have considered Friedleben's standards too high. As a result, various workers proposed standards based on weights of children dying of clinically recognizable illnesses lasting several days or weeks. In 1906, Hammar considered normal only thymuses from persons dying of accidents within from twenty-four to thirty-six hours of injury, thus eliminating from possible cases of status thymicolymphaticus those in which the weights were reduced or the patient was affected by inanition. In this work he made the first clearcut differentiation between the normal involution caused by age and the temporary involution caused by disease and malnutrition. He designated the latter accidental involution.

In order, first, to establish a standard of normal variability in the weight of the thymus and, second, to measure the effects of disease on it, I arranged the available data in the literature and in the necropsy records of the department of pathology of the University of Minnesota for four categories of causes of deaths (accidents, infections and undetermined and miscellaneous causes), according to whether the fatal illness had lasted one day, one week or longer. Following the method of Hammar, we based the standard of normal variability on the thymuses of persons who died of accidents within twenty-four hours of the injury and in whom no disease process was found at necropsy. Inspection of these standards shows that the median weights of these thymuses increase from 10 Gm. at birth to 20 Gm. in the first months of life, 28 Gm. at 6 years and 30 Gm. at 10, with a decrease to 20 Gm. at 20 and 10 Gm. at 90 years of age. Hence the weight is doubled in the first six months, tripled at 10 years and decreased to the size at birth in old age. Throughout total postnatal life the variability in the weight of the thymus is so great that the middle 80 per cent of weights fall in a zone as great as the median weight itself, and 10 per cent of normal glands would have a weight more than 70 per cent above the median weight. Also, at all ages more than half the weights would be above the 20 Gm. commonly considered evidence of status thymicolymphaticus. No other structure in the body, except adipose tissue, shows such high variability.

A similar graphic analysis of Hammar's detailed data shows that all the functioning tissues, namely, the cortex, the medulla and Hassall's corpuscles, have the same general curves for growth as the entire gland, except that the cortex reaches its maximum size at 4 years of age, while the medulla continues to increase in weight, and the Hassall's corpuscles in number, until puberty. On the other hand, the connective tissue with its fat increases continuously from birth to middle age, and then decreases during old age.

When the fatal illness of a known or unknown cause has lasted less than twenty-four hours, neither the weights of the gland and its parts nor the number of Hassall's corpuscles deviates significantly from the normal standard based on glands of persons who died of accidental causes within twenty-four hours of injury. When the illness has lasted more than twenty-four hours, the weights of the entire gland, cortex, medulla and, at times, the connective tissue and fat are significantly reduced, while the number of Hassall's corpuscles is increased—significantly so in cases of infections. When illness has lasted one week or more, all the parts of the gland have been significantly reduced except in exophthalmic goiter. In this condition the weight of the cortex and medulla and the number of Hassall's corpuscles are significantly increased, while the connective tissue and fat are normal in amount.

DISCUSSION

DR. M. A. GOLDZIEHER: Dr. Boyd's studendous work has brought home even more convincingly than Hammar that our conception of abnormal enlargement of the thymus needs thorough revision. This applies particularly to children, and I believe that it will be difficult in the future to attribute any sudden death of a child to a pathologic condition of the thymus. As a matter of fact, in my entire experience as a pathologist, and looking back over a series of more than 20,000 autopsies, I remember only one case in which I could attribute death directly to the thymus. In this case the greatly enlarged gland was caught between the manubrium sterni and the trachea, and the increase in size, due to edema, caused compression of the trachea and death by suffocation. In all other cases of sudden death I succeeded in finding some cause of death other than the thymus.

However, the question of a persistent pathologic condition or an enlargement of the thymus in the adult is far from being solved. Dr. Boyd points out the thymic hyperplasia in exophthalmic goiter, but this condition is also present in Addison's disease. In a considerable number of such cases I never failed to find an amount of thymic parenchyma which was well in excess of what we expect to find during adult life. Moreover, the patients in these cases were sick for a long time and showed general emaciation, which ought to induce a good deal of

accidental involution. Thus the amount of thymic tissue found becomes more impressive. In view of the fact that experimental work also points to an inverse relation between the suprarenal glands and the thymus, I feel inclined to believe that enlargement of the thymus must be considered as an expression of a general endocrine anomaly present in Addison's disease.

I should also like to emphasize the regular coincidence of a large thymus, although one perhaps still within the upper range of normal, and certain constitutional anomalies, such as a small droplet-shaped heart, a narrow and overelastic aorta, general arterial hypoplasia and lack of chromaffin tissue outside the suprarenal glands. In some of these cases there is also an abundance of lymphatic tissue, recalling the term status thymicolymphaticus, whereas in others no such excess of lymphatic tissue is demonstrable.

I believe that the old conception of status thymicolymphaticus needs thorough revision, but I do not think that there is enough evidence against the existence of a certain constitutional anomaly included with a large numer of normal cases in the old term status thymicolymphaticus. Let us not forget that the thymus is an endocrine gland from which Asher succeeded in isolating a potent substance (thymocrescin). The close interrelationship of the various endocrine glands makes it obvious that disturbances in one of these organs are readily followed by reactions on the part of the thymus, such as actually happens in exophthalmic goiter. Similar changes, of course, can be expected in other endocrine conditions which are also likely to express themselves morphologically.

DR. RUSTIN MCINTOSH: Dr. Boyd has given an excellent idea of the size of the normal thymus, and her figures cast doubt on the clinical condition that we have been trained to consider as status thymicolymphaticus. She does not attempt to decide from the basis of her work whether or not the thymus is an important organ, but clearly the burden of proof rests with those who say that it is physiologically significant, for Park and McClure were unable to show that its removal had any permanent effect on dogs. Dr. Boyd also avoids any attempt to explain the cause of the sudden death in these cases, which has been traditionally regarded as being due to conditions of the thymus. Her work forces us to look elsewhere than to the thymus for our explanation. I should like to pay special tribute to her application of the mathematics of statistical analysis. In a field where the clinician is easily lost and is confused by an unfamiliar vocabulary, she has skilfully translated her results into language one cannot fail to understand.

DR. MURRAY H. BASS: I, too, want to add my appreciation of Dr. Boyd's splendid piece of work. Careful, painstaking research such as hers and that of Hammar has at last given normal figures for the size and growth of the thymus. The confused state of knowledge of the thymus is well illustrated by the reports of the conference at the International Pediatric Congress in Sweden, at which the best men completely differed as to their conceptions of the subject.

I think that some one should say something from the standpoint of the clinician. It is true that correct figures concerning the size of the thymus are available, but does this help in interpreting symptoms which have been customarily attributed to the thymus gland? I fear not. From the clinical point of view, several entirely unrelated conditions are involved: (1) status lymphaticus, (2) sudden death and (3) obstructive symptoms.

How and why certain children die suddenly is still unknown. That the thymus mechanically causes suffocation is admitted, but this is rare. That there are certain children who show symptoms referable to lymphatism is surely a fact. Take, for example, the following case: A new-born infant was brought to me because of stridor and attacks of facial cyanosis. The spleen was moderately enlarged, the superficial lymph nodes were palpable, the blood showed only 5 per cent polymorphonuclear cells, and a roentgenogram of the chest revealed a large mediastinal shadow. The child was given roentgen treatment, and the stridor disappeared. The shadow in the chest, however, remained unchanged. At 5 years of age the child's enormously enlarged adenoids and tonsils became inflamed, and she was in bed for several months with cervical adenitis. When this subsided, it was felt

that the adenoids and tonsils should be removed, but a number of physicians refused to operate because the roentgenogram continued to show a large shadow. Finally, in desperation, I removed the tonsils and the adenoids without an anesthesia. The child made a perfect recovery and when seen a few months ago, at the age of 14 years, no longer showed a mediastinal shadow. I know of no other classification for such a case than in the thymicolymphatic group.

I should like to ask Dr. Boyd whether she has ever used the roentgen rays for treatment, and whether she has ever seen a treated patient die with so-called thymic symptoms.

That the average physician does not know the size of the normal thymus is well shown by the following unique case. I treated an infant, aged 3 months, who had a pulmonary condition for which roentgenograms of the lungs were taken. There was no thymic shadow to be seen. Six months later, the child fell from its carriage and was caught by the carriage-strap so that he hung suspended by the neck and was strangled. At autopsy the pathologist reported a large thymus. The parents naturally blamed all the physicians who had seen the child for not having made this diagnosis. However, I had the roentgenogram which showed a perfectly normal shadow. From the work of Hammar and that of Dr. Boyd we now know that the thymus appeared large only because the child had died a sudden death.

We are still in doubt as to the cause of the sudden death. At the International Pediatric Congress at Stockholm, Moro advanced what seems a plausible theory, namely, that there is a close relationship between the innervation of the thymus and that of the heart. He believes that death in these cases is due to sudden cardiac failure as a result of a disturbance in innervation.

Book Reviews

Ueber Tuberkulose der Kinder. By Dr. A. Viethen. Price, 6 marks. Pp. 80. Berlin: S. Karger, 1933.

Viethen summarizes the results of six years' experience with tuberculous children studied at the University Clinic at Freiburg. The plan employed by Viethen and his associates differed from that used elsewhere in Germany in that children were given special pediatric supervision and were separated from adult patients. By means of preliminary dispensary examinations and periods of observation for from five to six days in admitting stations, they separated the noninfected children and the infected children who did not require treatment from those who needed care. Children who needed treatment were admitted to institutions, whereas the infected children who were exposed but who required no treatment were cared for elsewhere and were reexamined clinically and roentgenographically three or more times annually. The preliminary classification of the cases whereby those not needing treatment were excluded from institutions accomplished a saving in expense of about 25 per cent.

As a result of experiences with children who were compelled by circumstances to live in contact with persons with open phthisis, they conclude that separation from contact exposure is necessary for infants and young children so long as they are actively ill. Under such circumstances they endeavor to place the child in an institution, with well relatives, in a foster home or in a suitable home until the acute process is inactive. When the lesion has become indurated and calcified, they believe that the danger of superinfection is no longer of great moment. They are also of the opinion that after the age of 3, the condition of children with or without active lesions tends to heal without separation from foci of contagion despite continued heavy exposure, and that for older children separation from foci of contagion is not necessary as a rule.

In discussing the symptoms, Viethen calls attention to the diagnostic significance of the decrease in cutaneous immunity (sensitiveness to tuberculin?), and of the occurrence of erythema nodosum. This latter condition, together with various cutaneous erythemas, often provides evidence of an active, fresh tuberculous infection.

Viethen occasionally observed focal reactions in the lungs following tuberculin testing. These activations of pulmonary lesions were most severe in infants. On account of the possibility of provoking focal reactions, they refrain from retesting infected children after sensitiveness to tuberculin has once been demonstrated.

From a study of bacilli in the gastric contents, the conclusion was reached that in instances in which detailed technic was required to demonstrate the organisms such cases were not important sources of contagion and did not necessitate alterations in the general plan of the work on tuberculosis.

Viethen discusses the roentgenologic technic, the differential diagnosis between infiltrations due to tuberculosis and measles and pertussis, the diagnostic significance of the hemogram of blood taken from the area of the positive tuberculin reaction and as compared with that from the finger tip and the diagnosis and prognosis of tuberculosis of hematogenic origin. In addition, he points out that vaccination against smallpox in his experience may result in the perifocal reactions and in a hematogenous dissemination of bacilli with the development of tuberculous meningitis.

Viethen's report includes 103 references to the literature from German sources.

This excellent report is of great value to physicians not only from the standpoint of the economies suggested, that progress can be made in organizing antituberculosis work by the establishment of preliminary diagnostic and observation centers for classifying patients, but by the utilization of the facilities of the home for the care of tuberculous children. The most important debatable point con-

tained in the report deals with the necessity of separating infected children with tuberculous lesions from contact with patients with open phthisis. Many in America, at least, believe that children of all ages should be separated from contact exposure irrespective of whether they have been infected or not, and, if infected, regardless of whether their lesions are active or quiescent.

The Clinical Study and Treatment of Sick Children. By John Thomson and Leonard Findlay. Fifth edition. Price, 30 shillings. Pp. 1,075, with 344 illustrations. Edinburgh: Oliver & Boyd, Ltd., 1933.

Before reading this book one should read the preface because then and only then can one understand what the authors are attempting to do. The following statement conveys the idea of the book: "The volume does not pretend to be a complete treatise of all disease as met with in the child, but is limited to a consideration of special varieties of morbid processes as modified, both in their course and appearance, by the growing patient, and of the methods of physical examination which are applicable in the very young."

As this is the fifth edition, it contains much of what was contained in the former editions, but the chapters on nutritional disease, rickets, so-called acid intoxication and rheumatic infections in childhood have been thoroughly revised. One is struck with the wealth and appropriateness of the illustrations. These are especially well chosen, clear and entirely illustrative. There is also an attempt to give reference to the leading articles on the various subjects, and it is quite a relief to find foreign authors who are so familiar with the American literature and willing to give credit to the same. On the whole, in spite of the fact that there are here and there small discrepancies, as, for instance, the failure to mention erythroblastosis as described by Cooley, the book is well worth having and well worth using. This book in the hands of the general practitioner should be peculiarly helpful, and yet the more scientific phases have not been neglected as would be assured by the fact that this edition has been revised by one of the most scientific of British pediatricians.

The First Two Years. Volume II. Intellectual Development. By Mary M. Shirley. Price, $3. Pp. 513. Minneapolis: University of Minnesota Press, 1933.

This is a detailed record of controlled objective observations on twenty-five normal infants from birth to 2 years of age. The author systematically applied a large number of tests at regular intervals in the homes of the patients. The results of the tests were supplemented by general observations. In this volume the author was interested in intellectual development. Like most tests on infants, the records are of physiologic development.

Several interesting and important conclusions are drawn. Among them are: 1. Human and animal infants follow the same general biologic laws, follow the same orderly sequence of development and adhere to the anatomic laws of developmental direction in that postural and motor controls begin headward and travel caudally. 2. This consistency of development in human and animal infants suggests the importance of maturation in the development of the behavior of infants. 3. New items of behavior emerge more rapidly during the first year. 4. Localization, vocalization and manipulation are little related during the first year.

Emotional development is not discussed. In addition to the theoretical conclusion, the book is of value because of the detailed and carefully recorded data.

Urologie Infantile. By Beer and Hyman. Price, 40 francs. Pp. 259, with 50 illustrations. Paris: Gauthier-Villars & Cie, 1933.

This monograph on the urologic disorders of infants was written in English by Beer and Hyman and translated into French by Fritz Busser. The extensive

experience of the authors in this field furnishes the basis for this book, but there are also numerous references to the writings of other urologists.

The first three chapters by Dr. Beer consist in a discussion of the general symptoms of urologic disturbances, methods of examination and various aspects of enuresis. Separate chapters are devoted to pyelocystitis, perinephritic abscess, foreign bodies in the urinary tract, congenital malformations, disturbances in urination, lithiasis, tumors, injuries, tuberculosis and the surgical treatment of nephritis.

The fundamentals of each disorder are concisely and clearly presented. There are numerous reproductions of roentgenograms. A few illustrative case histories and a short bibliography are added at the end of each chapter. Methods of diagnosis and treatment are fully covered, but operative technic is merely mentioned. This treatise offers a valuable clinical summary of the genito-urinary diseases encountered in infants.

An Evaluation of School Health Procedures. By Raymond Franzen. Pp. 127. New York: American Child Health Association, 1933.

This is the fifth volume produced by the School Health Study of the American Child Health Association. The purpose of this study, which began in 1926, was to determine the effectiveness of health work in schools as disclosed in end-results detectable in the children. This volume deals with the relation of health procedures in schools to the achievement of health. The entire work has been thoroughly done and excellently presented. It is of value chiefly to the superintendent of schools, supervisor, principal, teacher and school nurse.

In chapter II is presented evidence on the knowledge that teachers have of the deficiencies in the health of their pupils. Their description of defects is compared with the objectively measured facts. The evaluation of participation by teachers in the health program is considered in chapter III. Items of procedure on whose merit opinion is divided are discussed in chapter IV. The succeeding chapters deal with the classification of these items into theorems of health practice in schools. An inclusive test is offered to furnish the supervisor with a quantitative method of measuring the results of health procedures in schools.

Congenital Syphilis. United States Treasury Department, Public Health Service. Compilation 2. Revised June, 1930. Price, 50 cents. Pp. 373. Washington, D. C.: Government Printing Office, 1930.

This book contains a complete group of abstracts on congenital syphilis. It comprises a complete list of the publications that appeared previous to 1930 and following those included in Compilation 1.

CORRECTIONS

"Preventing Loss of Weight in the New-Born" by I. Newton Kugelmass, Ruth E. L. Berggren and Mildred Cummings (**46**:280 [Aug.] 1933).

In the third line of the paragraph bearing the italicized sidehead, "Preparation of the Hydrating Solution," on page 296, "1 level tablespoonful of table salt" should read "1 level teaspoonful."

"Treatment of Respiratory Failure in Acute Epidemic Poliomyelitis" by M. Bernard Brahdy and M. Lenarsky (**46**:705 [Oct.] 1933).

In the penultimate line of the first paragraph on page 712, "1140" should read "140."

Directory of Pediatric Societies

INTERNATIONAL

International Association of Preventive Pediatrics

President: Professor Taillens, Lausanne, Switzerland.
Secretary: Dr. P. Oltramare, rue Decandolle, Geneva, Switzerland.

FOREIGN

Royal Society of Medicine, Section for the Study of Disease in Children

President: Dr. Leonard G. Parsons, 58, Calthorpe Road, Birmingham, England.
Secretary: Dr. W. G. Wyllie, 33, Wimpole St., W. 1, London.

NATIONAL

American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman Dr. Alfred A. Walker, Highland Plaza Apartments, Birmingham, Ala.
Secretary: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.
Place: Cleveland. Time: June 11-15, 1934.

American Academy of Pediatrics

President: Dr. John Ruhräh, 11 E. Chase St., Baltimore.
Secretary: Dr. C. G. Grulee, 636 Church St., Evanston, Ill.
Place: Cleveland. Time: June 11-12, 1934.

American Child Health Association

President: Dr. Samuel McC. Hamill, 1822 Spruce St., Philadelphia.
Secretary: Dr. Philip Van Ingen, 125 E. 71st. St., New York.

American Hospital Association, Section on Children's Hospitals

President: Dr. H. C. Schumm, 425 E. Wisconsin Ave., Milwaukee.
Secretary: Miss Sophie Yoerg, 721 N. 17th St., Milwaukee.

American Pediatric Society

President: Dr. Charles A. Fife, 2104 Spruce St., Philadelphia.
Secretary-Treasurer: Dr. Hugh McCulloch, 325 N. Euclid, St. Louis.
Place: Asheville, N. C. Time: May, 1934.

Canadian Society for the Study of Diseases of Children

President: Dr. Frederick F. Tisdall, 170 St. George St., Toronto, Ontario.
Secretary-Treasurer: Dr. T. G. H. Drake, 67 College St., Toronto, Ontario.

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*Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

Society of Pediatric Research

President: Dr. Rustin McIntosh, College of Physicians and Surgeons, Columbia University, New York.
Secretary-Treasurer: Dr. Charles F. McKhann, Harvard Medical School, Boston.
Place: Atlantic City, N. J. Time: May, 1934.

SECTIONAL

North Pacific Pediatric Society

President: Dr. Arthur H. Gray, 1117 2d Ave., Seattle.
Secretary: Dr. Raymond H. Somers, Cobb Bldg., Seattle.

Southern Medical Association, Section on Pediatrics

Chairman: Dr. Hugh L. Dwyer, 406, W. 34th St., Kansas City, Mo.
Secretary: Dr. Luther W. Holloway, 117 W. Duval St., Jacksonville, Fla.

STATE

Alabama Pediatric Society

President: Dr. C. E. R. Parker, 401 S. Court St., Montgomery.
Secretary-Treasurer: Dr. John W. Simpson, 1117 S. 22d St., Birmingham.

Georgia Pediatric Society

President: Dr. Joseph Yampolsky, 311 Doctors Bldg., Atlanta.
Secretary-Treasurer: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.
Place: Augusta. Time: May, 1934.

Louisiana State Pediatric Society

President: Dr. Cecil O. Lorio, 245, 3d St., Baton Rouge.
Secretary-Treasurer: Dr. Maud Loeber, Tulane University, New Orleans.

Medical Society of State of New York, Section on Pediatrics

Chairman: Dr. Adolph G. De Sanctis, 12 E. 11th St., New York.
Secretary: Dr. George M. Retan, 459 James St., Syracuse.

Michigan State Medical Society, Pediatric Section

Chairman: Dr. W. A. Collins, 103 W. Burdick St., Kalamazoo.
Secretary: Dr. Edgar E. Martmer, 749 David Whitney Bldg., Detroit.
Place: Battle Creek. Time: September, 1934.

Nebraska Pediatric Society

President: Dr. W. O. Colburn, 724 Sharp Bldg., Lincoln.
Secretary-Treasurer: Dr. C. G. Weigand, 1614 Medical Arts Bldg., Omaha.
Place: As announced by committee. Time: Second Thursday of each month from October to June, inclusive. Dinner at 6 p. m.

North Carolina Pediatric Society

President: Dr. J. Buren Sidbury, 15 N. 5th St., Wilmington.
Secretary: Dr. E. K. McLean, 121 W. 7th St., Charlotte.
Place: Various children's hospitals. Time: Twice a year.

Oklahoma State Pediatric Society

President: Dr. Clark H. Hall, 117 N. Broadway, Oklahoma City.
Secretary: Dr. M. J. Searle, 108 W. 16th St., Tulsa.

South Carolina Pediatric Society

President: Dr. J. I. Waring, 77 Rutledge Ave., Charleston.
Secretary-Treasurer: Dr. Julian P. Price, Medical Bldg., Florence.

Tennessee State Pediatric Society

President: Dr. Owen H. Wilson, 706 Church St., Nashville.
Secretary: Dr. Joe T. Smith, 511 W. Church Ave., Knoxville.

Texas Pediatric Society

President: Dr. Sidney R. Kaliski, Moore Bldg., San Antonio.
Secretary-Treasurer: Dr. Frank M. Martin, 321 Medical Arts Bldg., San Antonio.

Virginia Pediatric Society

President: Dr. J. B. Stone, 2042 Park Ave., Richmond.
Secretary-Treasurer: Dr. Thomas D. Jones, Medical Arts Bldg., Second and Franklin Streets, Richmond.

West Virginia State Medical Society, Section on Pediatrics

President: Dr. R. C. Hood, 428 W. Pike St., Clarksburg.
Secretary: Dr. Russell C. Bond, 1325 Chapline St., Wheeling.

LOCAL

Academy of Medicine of Cleveland, Pediatric Section

Chairman: Dr. C. W. Burhans, 14805 Detroit Ave., Lakewood, Ohio.
Secretary: Dr. J. A. Garvin, 2009 Adelbert Road, Cleveland.
Place: 2009 Adelbert Road. Time: Four meetings, from September to May.

Academy of Medicine, Toronto, Section of Pediatrics

President: Dr. Gladys Boyd, 56 DeLisle St., Toronto.
Secretary: Dr. Lawrence Murray, 1870 Bloor St., W., Toronto.

Bronx Pediatric Society

President: Dr. Edward L. Benjamin, 2021 Grand Concourse, New York.
Secretary: Dr. Harry M. Schapiro, 1882 Grand Concourse.
Place: Concourse Plaza, 161st St. and Grand Concourse. Time: Every Second Wednesday of each month, except June, July, August and September.

Brooklyn Pediatric Society

President Dr. Carl H. Laws, 12 Pierrepont St., Brooklyn.
Secretary: Dr. Lewis A. Koch, 62 Pierrepont St., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Last Wednesday of each month, except June, July and August.

Central New York Pediatric Club

President: Dr. Frank Vander Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Fourth Thursday of October, January and April.

Chicago Pediatric Society

President: Dr. Charles Schott, 48 W. Division St., Chicago.
Secretary: Dr. Bert I. Beverly, 8 S. Michigan Ave., Chicago.
Place: City Club. Time: Third Tuesday of each month.

Dallas County Pediatric Society

President: Dr. P. E. Luecke, 4105 Live Oak St., Dallas, Texas.
Secretary: Dr. R. S. Usry, 1835 Garrett Ave., Dallas, Texas.
Place: Bradford Memorial Hospital. Time: 1 p. m., first and third Saturdays of each month.

Detroit Pediatric Society

President: Dr. John A. Johnston, 2799 W. Grand Blvd., Detroit.
Secretary: Dr. Edgar E. Martmer, 749 David Whitney Bldg., Detroit.
Place: Wayne County Medical Society. Time: 8:30 p. m., first Wednesday of each month.

Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.
Secretary: Dr. T. I. Willingham, 478 Peachtree St., N. E., Atlanta.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: Second Thursday of each month from October to April, 8 p. m.

Intermountain Pediatric Society

President: Dr. Helmina Jeidell, 11 Exchange Pl., Salt Lake City, Utah.
Secretary-Treasurer: Dr. Edwin R. Murphy, 9 Exchange Pl., Salt Lake City, Utah.
Place: Salt Lake City, General Hospital. Time: First Thursday of each month, 8 p. m.

Kansas City (Missouri) Pediatric Society

President: Dr. Hugh L. Dwyer, 406 W. 34th St., Kansas City.
Secretary: Dr. John Aull, 906 Grand Ave., Kansas City.

Memphis Pediatric Society

President: Dr. R. B. McCormick, 1074 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. W. D. Mims, 1024 Madison Ave., Memphis, Tenn.
Place: Memphis General Hospital. Time: Second Tuesday of each month.

Milwaukee Pediatric Society

President: Dr. Karl E. Kassowitz, 709 N. 11th St., Milwaukee.
Secretary: Dr. John H. Reynolds, 747 N. 27th St., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

New England Pediatric Society

President: Dr. Thomas A. Foster, 131 State St., Portland, Maine.
Secretary: Dr. Gerald Hoeffel, 319 Longwood Ave., Boston.
Place: Boston Medical Library. Time: Four meetings a year, occurring from September to May.

New York Academy of Medicine, Section of Pediatrics

Chairman: Dr. Martha Wollstein, Babies' Hospital of City of New York, New York.
Secretary: Dr. Harry Bakwin, 132 E. 71st St., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

Northwestern Pediatric Society

President: Dr. Alexander Stewart, 459 Lowry Medical Arts Bldg., St. Paul.
Secretary: Dr. E. F. Robb, 1801 Lyndale Ave., S., Minneapolis.

Philadelphia Pediatric Society

President: Dr. Joseph Stokes, 159 W. Coulter St., Philadelphia.
Secretary: Dr. James E. Bowman, 4091 Comly St., Philadelphia.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to June, inclusive.

Pittsburgh Pediatric Society

President: Dr. Henry C. Flood, 119 S. Highland Ave., Pittsburgh.
Secretary: Dr. E. R. McCluskey, Highland Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate months from October to April, inclusive.

Richmond Pediatric Society

President: Dr. F. Waring Lewis, Professional Bldg., Richmond, Va.
Secretary-Treasurer: Dr. A. S. Hurt, Jr., 1028 W. Franklin St., Richmond, Va.
Place: Richmond Academy of Medicine, 1200 E. Clay St. Time: First Thursday of each month (except July, August and September).

Rochester Pediatric Society

President: Dr. H. F. Rowley, 176 S. Goodman St., Rochester, N. Y.
Secretary: Dr. J. M. Parker, 26 S. Goodman St., Rochester, N. Y.
Place: Arranged by program committee. Time: Second Friday of each month from October to May.

Rocky Mountain Pediatric Society

President: Dr. J. A. Schoonover, Republic Bldg., Denver.
Secretary: Dr. Arthur L. Esserman, Republic Bldg., Denver.
Place: Children's Hospital, Denver. Time: First Saturday of each month from September to May, inclusive, 7 p. m.

St. Louis Pediatric Society

President: Dr. Hugh McCulloch, 325 N. Euclid Ave., St. Louis.
Secretary-Treasurer: Dr. Katherine Bain, Beaumont Bldg., St. Louis.
Place: St. Louis Medical Society. Time: Third Friday of every month.

Seattle Pediatric Society

President: Dr. Albert S. McCown, 509 Olive St., Seattle.
Secretary: Dr. Frank H. Douglass, Medical-Dental Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 7 p. m.

Southwestern Pediatric Society

President: Dr. James E. Harvey, 60 S. Lake Ave., Pasadena, Calif.
Secretary: Dr. E. Earl Moody, 3780 Wilshire Blvd., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. Gustave F. Weinfeld, Moraine Hotel, Highland Park, Ill.
Secretary: Dr. John P. Parsons, 320 S. Division St., Ann Arbor, Mich.